Chemical Library
MAY 15 1923

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CLXII. No. 3129.] LONDON, MAY 2, 1923. [75th Year. Price 1s.

OXIDE OF IRON
SPENT OXIDE

GAS PURIFICATION AND CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

PUMPING ENGINES
All Types for ACID, &c.
CAST-IRON OR STEEL TANKS
Any Capacity.
CHEMICAL PLANT.
Roofs and Girders. Structural Work.
SULPHATE OF AMMONIA PLANT
Air and Gas Compressors.
MIXERS.
TAR STILLS AND CONDENSERS.
W. NEILL & SON, Ld.
Engineers, Iron & Brass Founders,
ST. HELENS JUNCTION.
Telegrams: 'Neill, St. Helens.' Telephone No. 90.

"Ask Berk"
SULPHURIC ACID
(Made from Spent Oxide)
FOR
SULPHATE MAKING
F. W. BERK & CO., LTD.,
1, Fenchurch Avenue, E.C.3
Abbey Mills Chemical Works, Stratford.
Pentrepoth Chemical Works, Morriston.

"TORBAY PAINT"
FOR ALL PURPOSES.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C.
51, Old Hall St., LIVERPOOL.

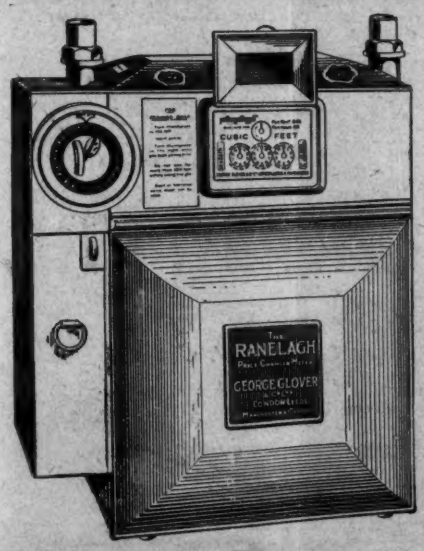
"BLUEBELL"
SILICA RETORTS
(95% SILICA)
John G. Stein & Co., Ltd.,
Castlecary, SCOTLAND.

Telephones:
1966 VICTORIA.
1967 Do.
Telegrams:
"GASIFICATION, Sowest, LONDON."
WALTER MOORE & SONS,
GAS COAL & COKE CONTRACTORS,
72, VICTORIA STREET,
LONDON, S.W. 1.

W. & B. COWAN
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON. MANCHESTER. EDINBURGH. GLASGOW.
SYDNEY. MELBOURNE. BRISBANE. WELLINGTON, N.Z.
(See Advertisement on p. iii. of Wrapper.)

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL,
NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.



George Glover's New
"Ranelagh"
Price-changer Pre-payment Gas Meter
The automatic valve of this meter **opens fully for the first coin,** even when set at as small a quantity as 5 feet per penny.
GEORGE GLOVER & Co., LTD.
Ranelagh Works, Royal Avenue, Chelsea, London, S.W.3.
Branches: 74, Diamond Street, Cardiff;
Ranelagh Meter Works, East Park View, Leeds;
City Meter Works, Port Street, Manchester.

Costs by using PERKUDUR ELASTIC PAINT twice as long as other Paints.
PERMONDSEY, LONDON, S.E. 16.

HORSELEY

OUR experience in constructing Gas Holders dates back to the beginning of the gas industry. In those days—as now—we were looked upon as one of the leading constructional engineers. Those responsible for producing equipment for the new gas industry naturally turned to us for assistance, just as previously we had the honour of building the first iron steamboat and earlier locomotives.

Ask us to quote you for Gas Holders, Tanks, Lamp Columns, and Constructional Work of every description.

THE HORSELEY BRIDGE AND ENGINEERING Co LTD
CONSTRUCTIONAL ENGINEERS AND GAS PLANT MANUFACTURERS
HEAD OFFICE AND WORKS TIPTON, STAFFORDSHIRE

DONKIN

for

DISTRICT SERVICE GOVERNORS

HIGH AND LOW PRESSURE SERVICE REGULATORS, METER REGULATORS,
STOVE AND LAMP REGULATORS, SERVICE CLAMPS AND FITTINGS.

THE BRYAN DONKIN COMPANY, LTD.,

Head Offices & Works, CHESTERFIELD.

LONDON OFFICE: 3, VICTORIA STREET, WESTMINSTER, S.W. 1.

Chesterfield Telephone No. 84.
London Telephone No. 5358 Victoria.

Chesterfield Telegrams, "Donkin, Chesterfield."
London Telegrams, "Donkin, Sowest, London."

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Holborn 6857. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXII., No. 3129.] WEDNESDAY, MAY 2, 1923. [75TH YEAR.

EDITORIAL NOTES.

Boys' Recording and Integrating Gas Calorimeter.

THE new recording and integrating calorimeter at which Prof. Boys has been labouring so long and patiently, enhancing operation and results as he proceeded, was the subject of a lecture by him at the Royal Institution last Friday. A recording and integrating calorimeter is an instrument in which so many factors have part, and so many conditions menace its integrity, that it is impossible to sit down and design one on theoretical considerations alone. Every part claims experiment and time, in order that design, methods, and material may be exactly what they should be, and all the parts have a relativity beyond reproach, with the result that the finished instrument will render duty automatically and continuously, and as nearly infallible as possible. Close upon twelve months ago, Prof. Boys delivered a lecture on the new calorimeter at the annual meeting of the Institution of Gas Engineers, and since then he has continued his investigating work, and has effected minor improvements, which have importance in respect of over-all accuracy. In the Royal Institution lecture, references to these changes were interspersed in the general descriptive particulars of the instrument; and in another part of this "JOURNAL," an indication is given as to their character. They all go to make for greater assurance in respect of accuracy and reliability. The instrument is now in operation, under ordinary working conditions, in certain London testing-places; and it is hoped that this year will see it in use in a few other parts of the country. Then, all being well, it may be anticipated that the instrument will be the one that will be generally prescribed by the Gas Referees. This is not official; it is solely expectation, seeing that no other instrument has, in daily running, met with the complete approval of the Referees, as being one upon which such dependence can be placed that it could be adopted for the purposes of the Gas Regulation Act.

Retort-House Practices and Storage Capacity.

THE question of realizing higher manufacturing efficiency by remodelling plant and practices has been very much to the fore lately in addresses and papers. In the thoughtful address which the President (Mr. T. F. Canning) delivered last Wednesday to the members of the Eastern Counties Gas Managers' Association, we have another contribution; and this of a valuable kind. It is "valuable" because Mr. Canning is practising what he preaches; and his practice is enhancing the stability of his Company, in respect of their operations as well as financially. In all matters relating to higher efficiency, one has to take a broad view. There is a point in gaining industrial efficiency where it does not pay to go farther; but if a survey could be made of the whole country, it would be found that in many gas-works, even with the plant in existence, the possible maximum profitable efficiency is far from being attained. All between that and the actual production is inefficiency and waste; and Mr. Canning has had opportunities of finding, in his professional career, that there is waste proceeding in retort-houses which represents substantial sums of money to the gas undertakings concerned. The realization from that waste of economy through higher efficiency is something upon which some men look very dubiously and superficially. They say that it costs money; and therefore it does not pay to be too particular. They do not look at what it means in the aggregate in the way of capital, labour, wear and tear, and costs generally, to increase productive efficiency. They cannot look farther than the value of the increase in productive efficiency per ton; they overlook the cumulative monetary effect of the higher production; and the financial balance on a twelvemonth's working. These men, whatever they may profess and call themselves, are not engineers, nor are they managers. There is a great deal to be done in ridding the gas industry of inefficiency. The President found, through wartime conditions and other causes, that there was considerable scope for increasing the manufacturing efficiency at Southend; and though he has accomplished much with the old carbonizing plant, by dressing it in new clothes in the way of its ironwork equipment, the application of governors, and applying system to the operations, he will be able to do more when the time comes for proceeding with improvements that will enable the carbonizing of heavier charges.

There are many managers of gas-works of moderate size who harbour the idea that the refinements necessary for securing higher carbonizing efficiency only fall within the province of the larger works; and, having persuaded themselves as to this without making an effort to do better, they continue to produce not only gas, but waste and high charges to the consumers. The President speaks from experience. He has found disgraceful and almost hopeless conditions in some works. He knows there is no occasion for this. He has satisfied himself (though the exactitude in procedure of the large works may not be completely followed in the smaller ones) that, even down to a 10-million-a-year works, system and control can be introduced into the retort-house which will yield a material improvement in the quantity and quality of the gas, and this without necessitating any increase in the staff. On all the works of which he has had charge, he has found that considerably better results can be secured by the process of tuning-up, or by that process combined with necessary alterations in design. It is by the latter means that he has effected a substantial change in the carbonizing results at Southend; and the cost of the changes that he has so far been in a position to carry out has been an investment which shows a handsome return. He has entirely reconstructed the fittings on the benches; and has introduced working with dip-pipes unsealed. New bridge pipes and part of the ascension-pipes had to be provided; and the hydraulic mains were supplied with a sight-feed liquor supply, and an adjustable overflow to each main. New tar mains, valves, and take-offs were fitted, and two tar-towers erected. A 12-in. governor was installed on one of the benches; on the other bench there was already one, but it had not been in operation for any extended period, as the former system of retort ironwork precluded the use of such delicate control. The retort-settings at Southend are fitted with one ascension-pipe; and with the existing stoking-machine only 10 cwt. charges can be carbonized. The President is of opinion that with this type of setting, two ascensions will be preferable, which is a controversial point. Better results will also be obtained by using a stoking-machine capable of putting in heavier charges, and working at a higher temperature than now. This will enable extensions to be deferred for some time, through the increased yield not only of gas but of secondary products. With the equipment changes that have so far been carried out, the application of system to working, the reconditioning of mouthpieces in the fitting-shop, and dealing with new mouthpieces in the same manner to ensure bottle tightness, with

the use of long augers (reconditioned every week), not only have results been improved, but stopped pipes are prevented, labour is lessened, and inerts are kept to a reasonable figure. System and control make operation something that is highly comfortable, while the want of them is a splendid creator of poor results, discomfort, and laborious working. We cannot imagine an engineer or manager, with the option of these two extremes in condition before him, choosing and persisting in the latter. Take the cost of properly reconditioning an old mouthpiece. At Southend, this is 12s. 6d.; but, says Mr. Canning, this is saved many times over by the absence of stopped pipes, and the loss of gas they entail, coupled with the lower inerts in the gas. With the use, too, of governors and unsealed dip-pipes, a very delicate control can be maintained over the carbonizing plant. Now with these changes, using a good quality unscreened Durham coal, Mr. Canning (notwithstanding the drawbacks of light charges and low temperatures) is producing 70 therms per ton of coal carbonized, as against 50 therms previously—the increase representing 40 p.ct. on the old make. This shows the difference between management of the modern order and that of—unfortunately we cannot say a past order, because it still exists in so many places. In addition, think what this passage from the address means: "The saving in the cost of gas oil alone "during the first year after the introduction of the system "I have referred to ran into thousands of pounds, owing "to the improved quality of the coal gas."

The next section of the address dealt with the interesting topic of the relation of holder capacity to consumption. We have come to the conclusion that in no part of a gas-works processes are the old text-book capacity formulæ at all reliable; and further that, in deciding upon capacity, not only for storage, but other things, general rules are altogether inadequate or inapplicable in these times when the conditions of manufacture, distribution, and demand have changed so considerably. The circumstances of every undertaking must to-day be taken separately, and decisions be made to conform with local circumstances and requirements. Mr. Canning's discussion of the relationship of storage capacity to output shows that the former could not be decided in the case of Southend by using the factor of maximum day's output. The present effective holder capacity is 1 million c.ft., leaving out of consideration a smaller holder (300,000 c.ft.) which is reserved entirely to supply compressors for reinforcing supply at Westcliff and Southchurch. The statistics in the paper show conclusively that, in such a district as Southend, it is the maximum hours' demand, and not the maximum day's output, that must determine the storage capacity that has to be provided. The output figures for two Sundays only in 1922 indicate that the present holder capacity is virtually only a four hours' supply when taken over the maximum cooking hours. Another interesting point is that Southend, with its influx of visitors in summer time, then makes a larger demand in the maximum cooking hours than in winter time. For example, the output between the maximum hours of 11 a.m. and 3 p.m. on the cooking load on Christmas Day, 1922, was 842,000 c.ft.; whereas with a total output of 2,271,000 c.ft. on the maximum summer day, the consumption between the maximum hours of 11 a.m. and 3 p.m. on the cooking load was 940,000 c.ft. In other words, the output during the cooking load on the maximum winter day is 33·6 p.ct. of the daily total output, whereas on the maximum summer day it is 41·3 p.ct. This indicates how Southend would be misguided if the old text-book formula as to storage capacity was adopted. The Company, advised by Mr. Canning, are doing the right thing. A new holder of 2½ million c.ft. capacity is now being erected. The same changes in condition that affect storage control the design of distribution systems; and, as the President submits, the test of the adequacy or otherwise of the distribution system to-day is whether the statutory pressure can be maintained on the peak load during the maximum hours' consumption throughout the system.

"Safety First" in Dwellings and Elsewhere.

In the address, we come to another question—that of gas leakage from the street mains—which has to be considered broadly, and in relation to modern developments, and the obligations of the users of the subsoil of roads. Furthermore, in this same connection, the gas industry has to consider not only the limits of its legitimate attitude in respect of consumers' piping and fittings, but its expedient attitude having regard to the effect of reputation upon business. It must be remembered, too, that the legislation under which the gas industry is working to-day was framed in the light of conditions that had no resemblance whatever to those prevailing to-day. We concur absolutely in all Mr. Canning says as to each user of the subsoil of roads giving all other users notification of openings, so that inspection can be made and observation be preserved to see that no immediate injury is done or conditions are altered in a manner that may be the potential cause of damage. We agree, too, with the idea of a suitably worded "Safety First" circular being distributed among the consumers with quarterly accounts, emphasizing especially the importance of losing no time in notifying escapes. Such a circular, however, must be "suitably worded," so as not to create public alarm, for which experience and available data show there is not the slightest occasion.

But there is a more knotty problem to be dealt with in the proposal that gas undertakings should inspect consumers' fittings and apparatus. We are afraid that in Mr. Canning's mind the effect upon the legal status of a gas undertaking of making this change has grown from something incorporeal to something very material. He says: "Plenary powers in "this direction may mean far-reaching responsibility being "thrown on the gas undertaking for every defective pipe, "fitting, and apparatus at present existing in its area of "supply, most, if not all, of which have been fitted by "persons outside the employ of the undertaking concerned. "The gas industry has no intention or desire whatever to "shirk its responsibilities to the consumer; but it certainly "does refuse to shoulder the responsibility for shoddy work "carried out by some of the so-called fitters that exist in the "areas of most undertakings." Certainly it does decline to do this. Many gas undertakings already inspect and keep in order the gas appliances they let on hire; so that, so far as these go, the principle of inspection is established. Efficiency of use also depends very much upon the adequacy of the piping in the house. There can for new piping work be powers of specification and inspection; but this would not carry responsibility for anything that subsequently happened to the piping. Electricity undertakings have the power to inspect wiring, and to refuse to supply where, in their opinion, the installation is not safe. Even then fusings occur, and damage is somewhat frequently occasioned; but there is no legal responsibility upon the electricity undertaking. The gas industry could have powers of specification and inspection; and it could have the right to refuse to supply where the piping is in an unfit or dangerous condition. Legal responsibility need not through this be increased.

There must not be too much talk of legal responsibility in this matter. If there is, it will encourage the idea outside the industry that the risk inherent to the use of gas is greater than experience shows it to be. But it is part of the duty of the expert gas industry, both to itself and its customers, to do its share to ensure safety where shoddy work threatens, and to secure adequacy of supply where false economy would impose severe limitations. We agree with Mr. Canning that this is a matter that requires full consideration. While prudence should take its place in that consideration, obligation to the interests of the gas industry and of the consumers should not be overweighted by timidity. The industry has been challenged; and it must legislate on the subject—remembering that it is out to supply not merely light, but all domestic fuel needs. Realization of obligation must coincide with our ambitions as to service; and prudence must be applied not only to the question of legal status, but to the protection of our work and business in the future. It is all very proper to advise the consumers with "Safety First" circulars. Let "Safety First" for the industry take a prominent place in the discussion of this important matter.

Relating to this part of the address, it will be seen from our news columns that the General Purposes Committee of the London County Council have reported upon the recent conference at the Board of Trade as to defects in gas-mains, escapes of gas, and inspection of domestic gas fittings and appliances. The Committee are of opinion that the conclusions of the conference should be generally supported. They regard as an important suggestion the recommendation that gas undertakings should be given additional powers as regards the inspection of piping and appliances in consumers' houses, and that they should be authorized to refuse to give or to continue to give, a supply of gas under certain circum-

stances. They are of opinion that careful supervision in these respects would do very much to obviate danger from leakage, and should moreover secure that consumers used gas with the maximum efficiency. It is remarked that effect might be given to the suggestion, if approved by the Board of Trade, by the insertion in future gas enactments of a model clause dealing with the subject. The Westminster City Council have also agreed with the conclusions of the recent conference at the Board of Trade, except in one particular. The exception has reference to the part a highway authority should take in circularizing information among users of the subsoil of roads. It will be recollected that at the conference it was suggested that highway authorities should, as far as practicable, before breaking-up or opening any highway for renewal or reconstruction, supply reasonable notice to all undertakers affected, and that the undertakers should forthwith, upon receipt of such notice, notify the highway authority of the position of their works in the portion of the highway to be broken-up or opened, and whether or not they proposed to execute any work in relation thereto. So far, there is no objection on the part of the Westminster City Council; but they do disagree with the proposal that the highway authority should summarize the replies received from the undertakers, and send a copy of the summary to each of the undertakers concerned. It seems to us that this is rather important, as it is just as likely that the servants of one undertaking might do mischief to the works of another as it is that the servants of the highway authority might do some harm. However, in the main, Westminster is in agreement with the London County Council; and we may take it that the views of these two important bodies will have weight in the future attitude of the Board of Trade in this matter. At the same time, the National Gas Council will look closely after the interests of the gas industry.

Reconstruction Work at Great Yarmouth.

THERE is always a fascination for an engineer in reading or hearing about the reconstruction, extension, or new work that a fellow-engineer has been carrying out, particularly when the engineer giving the information states the reasons for the selection of the types of plant and methods of working that he has adopted. The imparting of the reasons saves much inquiry or perhaps unexpressed wonder as to why some other types of plant were not chosen, or some other course pursued. The paper that Mr. P. D. Walmsley, B.Sc., read at the meeting of the Eastern Counties Gas Managers' Association last Wednesday, is typical of what a paper should be on reconstruction work, because in it he states in every part the why and the wherefore of each section of his plans; and in no single instance, save perhaps on one or two minor points, could there be any genuine criticism of what he has done. Moreover, the statement of conditions and of reasons indicates that, given other conditions with which to deal, Mr. Walmsley's decisions anp plans might have been different. We do not say they would have been; but it is the work of an engineer to do the best he can in the circumstances of time, cost, site, and the adaptability of buildings and plant already in existence. That best has been done at Great Yarmouth; and the results, from the points of view of both economy and efficiency, justify fully the described work.

It was only in the summer of 1919 that Mr. Walmsley went to Great Yarmouth; and he has had a busy time since. A new retort-bench has been built, with Guest-Gibbons charging and discharging machine, and all the necessary coal and coke plant. One of Humphreys and Glasgow's blue water-gas plants has been installed, of a capacity of 500,000 c.ft. A power-house has been constructed, which is occupied by two electricity generating sets. A new 60,000 c.ft. station meter has been incorporated among the plant. New sulphate apparatus has been erected, as well as plant for the complete distillation of tar, and benzole plant for the service of the Company's lorries. And a great deal of new building and re-building has been carried out by the Company's own men. It was very much an engineer's job to make decisions as to plans, on account of time, costs, the nature of the foundations, the conditions and limitations imposed by the existing plant, and—also important—the fact that the work had to be executed at a time when the holiday season was starting for the town, and the demand for gas customarily soars to the highest peaks. It can be appreciated that this was an anxious period. The first thing was to get the water-gas and the power-gas plants erected. In such circumstances, the value of a water-gas plant is indisputable. There is acknowledgment in the paper that the contractors for the water-gas and power plants—Messrs. Humphreys and Glasgow for the former, and the Keighley Gas and Oil Engine Company for the latter—did some most remarkable work. With the comfort that the completed scheme has brought the Engineer, he can, we imagine, look back upon those times with considerable satisfaction.

We will not touch upon the details of the new plant here; they will all be found in Mr. Walmsley's paper, which is printed *in extenso* in later pages of the "JOURNAL." But there is a matter of policy which is interesting in connection with the new electric power plant. Mr. Walmsley truly says: "We must practise what we preach; why advocate the use of gas-engines if we do not follow the practice ourselves?" For this among other reasons, gas-engines were adopted as the prime movers for the electricity generating plant; and the power house has, in consequence, been made quite a show place for potential users of gas-engines. This is as things should be; but later on we are again reminded of the words of the author: "We must practise what we preach." He tells us that "we have entirely eliminated the use of gas for lighting through gas-supply pipes." Does this mean throughout the works, or only in the retort-house where wasteful gas-flames are often employed, and in other places where open flames are a source of danger? If incandescent gas lighting has been eliminated from other parts of the works, and electric lighting established there, then this is not practising what, we are sure, Mr. Walmsley preaches. At the same time, the plant will demonstrate how gas can be used for supplying the energy for generating electricity for lighting purposes in industrial establishments.

Passing over other parts of the paper, we come to a comparison of the working results of the changes that have been made in the gas-manufacturing plant. When we see that the gas production per ton of coal has increased by about 2000 c.ft., and that carbonizing wages per 1000 c.ft. have descended from 8·54d. in 1919 and 1s. 0·5d. in 1920 to 2·39d. in 1922 and 1·87d. last quarter, one can frankly say, "Well done!" Some of the reduction is due to the lowering of the addition to wages imposed by the higher cost of living; but making due allowance for this, there is a considerable amount left to the credit of the new plant and improved operation. Among the working particulars, we should have liked to have seen an analysis of the total manufacturing costs on the therm basis.

Practically Testing and Rewarding the Ability of Gas-Fitters.

THERE has been much said and written lately on the subject of the part that indifferent work by gas-fitters has in promoting dissatisfaction among gas consumers. As in every other class of work in the gas industry, that of the gas-fitter requires a more extended qualification than was the case not many years ago, when the uses of gas were fewer, and the apparatus and appliances were of a plain order. The knowledge and skill of the gas-fitter have to-day to be of a varied kind; and upon his work depends very much—providing the appliances fixed are all they should be in efficiency and capacity—the satisfaction of the consumer. If there had been more competent recommendation, and more efficient work, by gas-fitters during the past few years, there would have been much less complaint. There are many opportunities now for gas-fitters improving their knowledge of the technique of the varied lines of their business; but not long since there was not altogether satisfaction that the tests of their practical ability were all they should be in connection with the examinations that are held to test their competence and knowledge.

The City and Guilds of London Institute Examinations that are being held remind us of this matter, because we are aware that for some years past, the present Chief Examiner in Gas-Fitting (Mr. R. J. Rogers, of Birmingham) has held the view that some better method of testing the ability of gas-fitters' practical work was necessary. Hitherto the practical test of the gas-fitter has taken place in a workshop usually attached to the Technical Institute at which the gas-fitter has been attending; and it has not always been possible to set such tests as would satisfactorily indicate and determine the ability of the candidate as a craftsman in gas-fitting. We are cognizant, too, of the fact that, in August last, as Chief Examiner in Gas-Fitting, Mr. Rogers called

a meeting of Local Examiners (with the approval of the Institution of Gas Engineers and the City and Guilds of London Institute), with a view fully to discuss the conditions under which the practical examinations for gas-fitters should be carried out, in order to prevent the possibility of a certificate being awarded to any man who is not a wholly qualified fitter. At the conference it was agreed that, in addition to the practical examination held in the school class-room, and the written and the *vivâ voce* examinations, a further test should be made of work on the district, to ensure that the candidate was entitled to a first-class certificate in gas-fitting in the final grade. The local examiners from various districts in the country agreed with Mr. Rogers that such a test was necessary in the interests of the examinations generally. Previously, it had been possible for a man to enter the examinations, and pass successfully the written portion, and also to make a creditable performance in the tests set in the class-room, but who was not necessarily a district gas-fitter. The additional test should increase the value of the certificate to the candidate; and it is hoped that gas undertakings will recognize in some way gas-fitters who go to the trouble to prepare themselves for the examinations, and eventually obtain the final certificate in gas-fitting. The Birmingham Gas Department (in order to encourage craftsmanship among the gas-fitters) reward the successful candidates by granting an increase of 2s. per week to their wages. The examination of candidates' work on the district took place for the first time this year last Friday; and it was followed on Saturday by the *vivâ voce* and practical tests in the workshops.

Gas undertakings generally should devote more attention to this question, and extend encouragement to gas-fitters to improve their knowledge, as it is apparent that, however desirous the management of undertakings may be to give good service to their consumers, this cannot be fully realized, unless the work carried out on consumers' premises by gas-fitters is thoroughly efficient. Many instances could be quoted where the excellent work of salesmen in obtaining goodwill and orders from gas consumers, has been nullified by the fact that the work has not been carried out with the desirable efficiency.

Long Life, Health, and Happiness.

The men of the gas industry join with the utmost felicity in the world-wide expressions of good wishes to the Duke and Duchess of York on the occasion of their marriage. The deep interest that the Duke has taken in the question of industrial welfare is well known to all. Towards the end of last year, he made himself acquainted with the operations of the gas industry, by visiting the Beckton Gas and Chemical Works of the Gas Light and Coke Company. Some weeks before the marriage, the Chairman of the Birmingham Corporation Gas Committee (Alderman J. H. Lloyd), on behalf of the Department, presented His Royal Highness with a gold cigarette case, with a beautifully enamelled photograph of the Duke and his *fiancée;* the enamelling having been done by the aid of a gas-heated muffle.

Improved Stoking Machinery.

It seems scarcely possible, and yet it is so, that twenty years have passed since it was our pleasure to visit Bruges, and to see there the originals of the De Brouwer projector in operation; and in Belgium we then wrote the article that brought the machine prominently before British gas engineers. From time to time experience has introduced improvements. The latest of these are described in an article on the De Brouwer projector and the new Williams-Jenkins patent pusher which appears in our columns to-day.

Electricity Charges.

Not long since, the gas industry was being "slated" over the increase of the charges in a number of individual accounts, which it has been proved were not representative of general experience. With improved conditions in respect of the costs of labour and materials, therm prices have descended; and now consumers are daily finding out more and more the advantage of being charged on a thermal basis instead of by the old volumetric method. They are getting what they want; and they are paying only for what they get in heating value. Now the Court of Common Council of the City of London have a grievance. The electricity consumers in the City are paying heavily for current compared with pre-war years, and more than is being charged to-day in certain Metropolitan boroughs and several large provincial towns. This is regarded as being unfair, in view of the dividends the two supplying Companies are paying. In 1913 the City of London Company were distributing 10 p.ct.; in 1922, 15 p.ct. The Charing Cross (West-End and City) Company paid in 1913 6 p.ct., and in 1922 10 p.ct. It can never be charged against the Gas Light and Coke Company (who supply gas in the City) that they are now paying extravagant dividends in comparison with the pre-war ones. Before the City section of the Charing Cross Electric Supply Company was brought into being, the Court of Common Council favoured it on the ground that competition would be good; now it is asserted that there is an "unholy alliance" between the two Companies, or at any rate an understanding, regarding prices. If this is so, then the object for which the second Company was admitted to the City has been defeated.

Pastures New.

A correspondent sends us a copy of a prospectus of the Chagford and Devon Electric Light Company, Ltd., in the hope that the names of the Directors will supply us with "interesting reflections." They do, or at any rate two of them. Lieut.-Col. E. Eaton, C.E., is the Chairman; and his fellow Directors are Sir Charles B. H. Soame, Bart., and Mr. R. G. Harley. The names of Eaton and Soame were prominent in that huge batch of prospectuses which we have preserved right away from those days when a number of little gas companies were floated with big names and capitals commensurate with the dignified position and prospects that were so enthusiastically portrayed on paper. Most of those companies have since passed through the hands of liquidators. It is an easy passage from gas to electricity. In the Chagford "and Devon" Electric Light Company's prospectus, no statement is made as to the past financial results of the concern; nor is any estimate made as to prospects. All that is said is that the receipts from the sale of electricity and rents of meters for the past four years to December, 1921, show an increase averaging about 18 p.ct. above the previous average receipts, and a number of new consumers are awaiting a supply. This is very vague. In the old gas company promoting days, disclosures and estimates were of a more liberal character. The issued share and debenture capital of the Company amounts to £11,790. Of this, £8000 consist of 7½ p.ct. first mortgage debentures, £2611 9 p.ct. cumulative preference shares of £1 each, and £1179 ordinary shares of 5s. each. It is now proposed to issue £2389 of 9 p.ct. cumulative preference shares, and £3000 7½ p.ct. first mortgage debenture shares. Fancy to-day offering 9 p.ct. for preference shares, and 7½ p.ct. on first mortgage debentures! Why these baits? In an accompanying circular, we read: "The smaller progressive electric light companies' shares and debentures are worth consideration by those who can afford to wait for dividends." Those words will no doubt receive profound consideration by, and sink deeply into the minds of, those people who have money to invest.

A Co-Partnership Bill.

There has been introduced into the House of Commons a Bill having for its purpose the promotion of the more general adoption of co-partnership between capital and labour by statutory and other companies. The measure proposes that a body shall be established to be called the Industrial Co-Partnership Commissioners. The Commssioners are to be five in number—one each to be appointed by the Trades Union Council, the Federation of Employers in British Industries, the Labour Co-partnership Association, the President of the Board of Trade, and the Chancellor of the Exchequer. The next clause gives power to companies to submit co-partnership schemes to the Commissioners for their approval; but every scheme is to provide (*a*) for the payment to all employees, in addition to any share in profits, of wages at rates not being less than the rates commonly paid in the district for work of a like nature; (*b*) for the fixing of a basic rate of interest on capital invested in the business; (*c*) for the investment of some part (not being less than one-half) of the employee's bonus in the capital; and (*d*) that the employee's bonus, whether paid in cash or in stock or shares, shall not be liable to forfeiture for any legal act or omission of the employee entitled

thereto. A strong inducement to enter into a scheme will be found in a subsequent clause which reads as follows :

> From and after the passing of this Act, every company which puts into operation a scheme approved by the Commissioners under clause 2 of this Act, shall, so long as such scheme shall be in operation and the approval of the Commissioners thereto shall not have been withdrawn—
>
> (1) Be assessed and charged with income-tax at three-quarters of the rate ordinarily charged in the current year, and so that certificates issued by such company to its proprietors of payment by the company of income-tax on dividends or debenture interest at such reduced rates shall operate to discharge the proprietors entitled thereto from payment of income-tax on such dividends or debenture interest at the full rate of income-tax then current.
>
> (2) Be charged for stamp duty on the issue of capital at half the rate in force at the time of such issue.

A subsequent clause provides for preference to co-partnership companies in the allocation of Government and other contracts; and a further section deals with the revenue and expenditure of the Commissioners.

Miners' Wages and Hours.

The National Wages Board for the Coal-Mining Industry last week had before them an application from the miners' section for an increase in the minimum wage of the lower-paid men in the industry. It is stated that the minimum wage is 45 p.ct. above the pre-war average for a seven-hour day for underground workers, as compared with eight hours previous to the war; while the March cost-of-living figures were 76 points above the 1914 figure. Nearly 700,000 men are now earning wages above the minimum. The Central Executive of the Mining Association are asking for a change to be made from a seven-hour to an eight-hour day. The shorter day, it is submitted, is having a serious economic effect at some of the older collieries.

Wages Ascertainments.

The wages ascertainments for Durham and Northumberland have been issued during the past week for the months of May and June. In the case of Durham, they show a rise of 13·48 points, and in the case of Northumberland 9·85. This will mean, roughly speaking, another 8d. a shift for hewers, and approximately 1s. a ton increase in the cost of production in the case of Durham, and something less in Northumberland. In the present state of the coal market, where prices are entirely ruled by supply and demand, there can hardly be any question of any increase in price to the consumer due to the increased cost of production. At current market rates, there is ample margin of profit for collieries to be able to bear the extra cost. Everyone will welcome the increase in the miners' wages, as it must be acknowledged that they have had a bad time since the National Agreement was signed, and that lately they have been "putting their backs into it," culminating in last week's record output. But the extent of the rise has come as a surprise to most. The figures are based on January and February results, when very little coal was available for sale at the higher prices as compared with March and April, on which July-August wages will be based. So that a substantial increase in costs must be looked for in the second half of the year. It is to be hoped that the men will continue to maintain the output, which is, after all, one of the chief factors in keeping down costs, and at the same time keeping-up profits, which, of course, under the profit-sharing agreement, means better wages. Something in the nature of a bombshell has been dropped in the intimation of the Unions that they are going to make May day an "idle" day. It is an astonishing move, when so much has been heard about starvation wages. It is certainly a move on the part of the Lodges, and will not be universally popular among the men, who appear to have had very little say in the matter. It means the loss of a whole day's coal, and an "idle" day always means a poor output on the following day as well. Trade is good, prices are high, and the loss of a day's coal output, quite apart from its economic seriousness, is bound to make itself felt in the next wages ascertainment. The present intention of the owners, if they cannot at the last moment persuade the men to take wiser counsels, is to throw the pits open. It is unlikely that much, if any, coal would be won; but, in districts where rent is paid, this would be forfeited as well as the day's wage, and the wages of minimum wage men would be affected for the whole week in the case of those who did not go to work.

PERSONAL.

The Walsall Town Council last week approved of the recommendation of the Gas Committee, and appointed Mr. FRED DAVIES Engineer and Manager of the Corporation gas undertaking, in succession to Mr. B. W. Smith. The Mayor (Alderman Warner), in offering congratulations to Mr. Davies, said that he hoped in twelve months' time Mr. Davies would have proved to every member of the Council worthy of the confidence they had placed in him. Mr. Davies, in thanking the Council for the appointment, promised them that nothing would be lacking on his part to make the undertaking as successful as possible. The last four years had been exceptionally difficult; but he thought they had weathered the storm in a satisfactory manner. Now conditions were returning to something like normal, he believed a very prosperous time was ahead.

A hearty welcome awaits Mr. PHILIP HOLMES HUNT, who, with his wife and two daughters, is expected to arrive within a few days on a visit to this country from Australia.

The Sutherland Meter Company, Ltd., of Witton, Birmingham, have appointed Mr. STANLEY STURGES to represent them in the North of England.

Sir HENRY BIRCHENOUGH and the other two of the six members of the Governing Body of the Imperial College of Science and Technology appointed by the King under the Charter of Incorporation, on the expiration of their term of office, have been re-appointed by His Majesty for a further term of four years from June 1 next.

At Leicester recently, Miss Evelyn May Cowell, second daughter of Mr. A. Cowell, of the Leicester Gas Department, was married to Mr. ARTHUR STANLEY RICHMOND, eldest son of Mr. J. A. Richmond, of the Plymouth Gas Company.

At a meeting of the Birmingham Gas Committee on Monday, reference was made to the long service in the department of Mr. R. A. DRY, and to him was presented by the Lord Mayor (Alderman David Davis) an illuminated address (in album form) of appreciation. Alderman J. H. Lloyd (the Chairman of the Gas Committee) stated that Mr. Dry had been in the service of the gas undertaking since October, 1872—a period of over fifty years. As a boy he commenced on the clerical staff at Windsor Street under Mr. Charles Hunt, and subsequently became Chief Clerk. In 1901 he was appointed to the position of Coke Salesman on the retirement of Mr. David Jones. In this position he had displayed great ability, keenness, and business acumen; and during his term of office the sales of coke in Birmingham were organized and conducted in a manner which aroused the envy of other gas undertakings. Under Mr. Dry's supervision, definite lines of policy were laid down in connection with coke sales, which resulted in a largely increased revenue to the gas department. To Mr. Dry might also be attributed, to a considerable extent, owing to his constant representations, the improved screening and grading of the coke, which enabled the department to get into new markets and obtain higher prices. Mr. Dry suitably replied.

OBITUARY.

Sympathy is extended to Mr. L. G. HALL, the Gas and Water Engineer at Rhyl, who has had the great misfortune to lose his wife, after a long and trying illness, aggravated latterly by blindness, but borne throughout with heroic fortitude and cheerfulness.

Demonstrating Temperature Effect on a Gas.

A note describing simple means of demonstrating the effect of temperature upon a gas has been contributed by Mr. Charles De Witt Hurd, of the University of Illinois, to the pages of "Industrial and Engineering Chemistry." The two experiments which he there outlines show that a gas will contract with a decrease in temperature, and will expand with an increase in temperature. Six grams of soap are added to 80 c.c. of distilled water in a tall 100-c.c. beaker. The mixture is heated nearly to boiling, until the soap is entirely dissolved. A test tube is warmed, and at the same time the inner wall of it is lubricated by filling it with the hot soap solution. This soap solution is immediately poured back into the beaker, and a soap film is formed across the mouth of the tube. This can be done easily if the mouth of the tube is dipped just below the surface of the solution and then withdrawn. This film will rise in the inverted tube as the tube cools. It can be made to rise rapidly if the walls of the tube are surrounded by a cold, wet cloth. This shows the contraction in volume due to a decrease in temperature. It is simple also to demonstrate gaseous expansion due to an increase in temperature. A soap film is formed across the mouth of a cold test tube. If the rounded glass end of the tube is thrust into the hot soap solution in order to warm it, the soap film at the other end will form a bubble.

We have received from Holland a brochure which has been issued in celebration of the seventy-fifth anniversary of the Leiden Municipal Gas-Works. Founded in the year 1848, they are at present flourishing as a joint undertaking with the municipal electric supply. The brochure gives an interesting history of the concern, illustrated with many photographs of its activities in numerous spheres.

ELECTRICITY SUPPLY MEMORANDA.

We can afford to sympathize with the electrical industry in the ardent desire of its men to get people to heat their homes, cook their food, and boil their water, in the most expensive way that has ever been offered to them. Electrical men try all sorts of devices to get custom for these purposes; but the more people put their recommendations to the test, the greater the obstinacy of the public in taking cheerfully and willingly to electrical operation. The public, or a very considerable section, have wisdom. To try to tempt them to electrical installation, tariffs of various and singularly constituted form have been devised; and electrical salesmen have been told over and over again what they must do in order to gain custom. They must even carry demonstration into the home. A portable electric-oven must be part of their equipment; and they must be able to cook. We hear of the wonderfully successful exploits of some electrical men in cities thickly populated, where they have succeeded in placing among their friends some 200 to 300 cookers. Then comes that long discouraging pause, when the business sticks in the mud; and the application of electricity as a general means of heating and cooking seems, and is, as remote as ever. Manufacturers of cooking apparatus are becoming disappointed. They no longer carry large stocks. The sample electric-cooking equipment in many a showroom has become one of the oldest inhabitants, and appears likely to continue there for ever, if the space cannot be better occupied. The same with electric water-heating apparatus, and particularly the thermal storage kind. It is no good. Electricity was never intended to be a method of general heating in domestic and industrial service; it can only be of real use in industrial work for very special purposes, and not at all in domestic heating work, other than for quite small uses. Even then, few can afford to pay, and will not pay, more for electricity than the service can be rendered for by other means. This is simply the commonsense action of looking facts squarely in the face. People supplying such a popular commodity as gas for cooking and heating can afford to be generous to a less successful rival.

Ineffectual Efforts.

Insuperable Difficulties.

The "Electrical Review" has been writing on these subjects. It heads its editorial "Helping Smoke Prevention;" but the article itself is one of the best we have ever read which shows such an amount of impotency on the part of electricity in the heating field that a better title would have been "Non Possumus." Far from helping smoke prevention, the article says as plainly as it can do, "we would, but we cannot." In most respects, the writer is perfectly fair. He admits that there are several means by which the domestic processes in which heat is required can be carried on smokelessly. Anthracite, coke, gas, and oil can be adapted for general heating, cooking, and the provision of hot water. "It is possible," writes our oldest electrical friend, "to equip a town house very comfortably with anthracite stoves in the hall and the dining-room, a slow-combustion coke and rubbish-burning stove in the kitchen for hot water, gas-fires in the drawing-room, the study, and the bedrooms, and a gas-cooker for meals." A house so equipped, it is admitted, is no rarity; and our contemporary believes that most people will be able to recall several instances within their own knowledge. All the methods, it is acknowledged, mark "a great advance" over the crude burning of bituminous coal in open fireplaces for heating, and in a kitchen range for cooking and providing hot water. Then we receive what is intended to be a facer. "But electricity possesses even more advantages than, and none of the attendant disadvantages of, any of them." We smile good-naturedly. We cannot expect an electrical paper to say anything else. But there is one enormously weighty disadvantage, and that is the cost of accomplishing any one of these processes—not in a temporary and small way, but continuously. The requirement for heat in domestic life is something that is continuous, and not merely an occasional thing; and therefore the economy or uneconomy of the heating agent is cumulative, with, in the latter case, strong attestation in the quarterly account. The inability to meet practical needs is a congenital and physical trouble; one might almost call it a physical infirmity. To take the expenditure of coal in steam-driven stations, and find that it takes an average of over 3 lbs. of coal—say, approximately 40,000 B.Th.U.—to produce about 8 p.ct. of the expended quantity of thermal energy in the form of electric heat, indicates why electrical heating operations must fail as a permanent and general thing.

An Ineffective Remedy.

However, in the article a little more praise of electrical operation is meted out. We are told that it is effective, adaptable, and completely under control. It might be effective if enough of it could be used, and it was possible to apply it in sufficiency in a practical and economical manner in all circumstances. We do not deny that it is clean, and leaves no ash. Not even a child would repudiate that assertion. But that it makes no smell when the heating elements are suffering from the influences of time and burnt substances, we entirely deny. "It [electricity] does not escape, and cause loss of life." We refer our contemporary to its own almost week by week tale of electrical fatalities. In the very issue in which the article under notice appears, there are paragraphs, relating how a man met with his death while testing a cable, and how another was recently killed by a shock received from an electric-lamp, which reminds us of the recent case of the death of a restaurant keeper in London while using a portable lamp. That by the way. Our contemporary asks why it is that electricity is not in more general use for domestic purposes other than lighting. "Even those who may reasonably be supposed to believe in the paramount claims of electricity for all household purposes—the electrical engineers who design or manufacture or sell the apparatus, or who generate or distribute the energy—even they make, in general, far too little use of domestic electricity." And we do not blame them. The "Review" asks itself why electrical men do not use electricity exclusively for all purposes in their homes. The only answer it appears capable of giving (it is silent on the cost of thermal energy, which some electrical men try to hide by talking of that inadequate covering—efficiency) is that the apparatus itself is too expensive. First it is necessary to wire to the points at which the appliances are to be used; and this means money. Electric-cookers, too (which are far more expensive than gas-cookers), have to be bought. All the other appliances—electric kettles, grills, toasters, &c.—are handy and useful. But they cost a lot of money. Then we come to the remedy. What is wanted is a large number of living examples of electric homes. If people could be shown that "the cost was not so great as was supposed, while the food was excellently cooked with less waste, . . . and that there was always plenty of hot water—if all this could be done, people would burn with the desire to have them in their own homes." Would they? But there is the confession as to the expense of the appliances. They will always be more costly than gas appliances, because of the additional structural work in them. Therefore, "electricity supply authorities should do all they can to remove this obstacle by providing the apparatus on hire or hire-purchase at the lowest possible rates, besides facilitating their use by the adoption of a smaller tariff." But some are offering the appliances on hire and hire-purchase; and after the first flash of encouragement has died away, the offer might just as well be made in the wilderness.

Concealed Knowledge.

If there was a little more commonsense displayed over this question of cooking and heating, electricians would realize that it is not alone the cost of the appliances and their installation that is the difficulty. If there were all the economy and value in their use that is pretended or postulated, then many people would willingly pay for the appliances, in order to secure the permanent economy and accompanying value. But they do not. The electricians should inquire the reason why. Then they would find—if they already do not know it—that there is something more in it than they care to say. They do know this. Anyone who can read between the lines of the "Review" leader on "Helping Smoke Prevention," can, at any rate, see the existence of the knowledge in the mind of the user of the editorial pen.

A Slogan Wanted.

The Electrical Development Association are proposing to add to the devices for securing electrical custom by advertising a competition for a slogan. To require a slogan for developing custom suggests conditions of extremity; and it is a poor case which needs such assistance. To those who are clever at this sort of thing, there are awaiting them prizes of £10, £5, and £3 for the best three slogans sent in during this or next month. "Meteor" of the "Electrical Times" is not very sanguine as to the result. Electricity, he says, is a thing to conjure with; but the word itself is not. He thinks that "gas" could be slipped into almost any catchy or musical combination without spoiling the lilt. The "Electrician," too, does not appear to be very hopeful. "It is," it says, "certainly very difficult to compress pleasantness, sentiment, humour, and kick into three or four words." If we suggest "Electricity the Elect," it might be considered too sombre; it might raise a laugh with some people; but we cannot say anything about the "humour" or the "kick." We are not anticipating a prize.

Summer Business.

The electrical papers are talking about the summer time work in developing electricity business; but there is precious little that is new in what is said. One writer does not think there is enough push in this direction; and another suggests there is too much concentration on cost, and too little on the ancillary virtues of electricity. In "Electrical Industries," the writer of "Gossip" makes the point that, when an electric fire or cooker is sold, frequently enough a saving in money is shown resulting from the reduction in coal or coke used in the house, even if these raw fuels are still employed for some of the principal heating work; but the prospective user is not often reminded that, for the average middle-class house, every ton of coal brought in has to be carried by the housewife or her servant to the range or fireplace, to say nothing of up and down stairs. Of course, the latter argument applies to the cheaper gas equally as to electricity—both being in these respects labour-saving. But really we cannot see how, for equal heating effect, the electric-fire can show a saving over the coal-fire. We can purchase, at 50s. per ton, 3·7 lbs. of coal for 1d., with a potential calorific value of 48,100 B.Th.U. Using this quantity of coal at 24 p.ct. efficiency, 11,544 B.Th.U. would

be given as useful heat. The claim of 100 p.ct. efficiency (which some people make, and few believe in) for the electric-fire, would mean that only 3420 B.Th.U. would be given to a room for 1d., where this is the price per unit of electrical energy. Of course, the electric-fire, like the gas-fire, can be discontinued when not required. However, the topic is summer business; and the same writer puts forward the electric-cooker as the line of business that summer time should particularly encourage; for with it the possibility of keeping the kitchen cool and avoiding dust becomes obvious. A writer, under the heading of "Trade Talk" in "Electrical Industries," suggests the selling of fans and small cooking appliances. Very wisely, he does not mention the larger ones. Lamps and fires can be missed just now; but there should be no hesitation at any time in telling the public all about these goods. He thinks, too, the time is quite opportune for securing wiring business. People will now be moving into larger houses. These will be owners, and not merely tenants renting houses, as there are few to be let now. They should be told, according to this writer, how electricity saves decoration work. He also advocates making friends of the local estate agents. Gas salesman will note.

The Question of Tariffs.

The "Electrical Times" is about to publish a list of the electricity supply tariffs that have come into force "all over" the Kingdom. It considers that the matter of tariffs is just now such a vitally important one to the electricity industry that opinions on possible improvements would be heartily welcomed. Electrical tariffs have always been vitally important to the industry, judging from the energy that has been displayed in producing a crop, not one of which appears to be universally acceptable. Our contemporary asks, Do they need revising in view of the cooking and heating load? It quotes the old apothegm: "There is a tide in the affairs of men, which, taken at the flood, leads on to fortune." We have not seen much of the tide in electric cooking and heating, and certainly have overlooked the flood. Our contemporary goes on to remark that the industry is faced with "this crisis." It is difficult to know what is meant by "this crisis;" but, having mentioned the "tide" and the "flood," it adds that before the industry is a prospect of *El Dorado*. The mixed metaphor is delightful. But before entering upon the publication of a list of existing tariffs, our contemporary has published some reflections on tariff reform by Mr. A. T. Cooper. The article is a long one; and enters upon all sorts of considerations applying to the subject. But generally the author holds that the ideal towards the attainment of which electricity undertakings should strive is that of a general purposes tariff system for the supply of electrical energy irrespective of the uses to which the supply is applied by the customer. He points out that in all existing tariffs load factor is still recognized either by the direct application of some form of demand charge, or by the division of consumers under categories according to their estimated load factor potentialities. In the past, a great deal has been made of the factor of the time of day at which an electricity consumer makes his greatest demand on the supply undertaking. As the effect of this factor is likely to vary not only with the undertaking itself, but also perhaps with each decade of its existence, it would surely be expedient to neglect it if a uniform basis be so calculated as greatly to increase that magic factor diversity. Mr. Cooper suggests that the primary aims of a general purposes tariff should be to make it equally, intelligibly, and equitably applicable to all and every class of demand, to simplify consumers' wiring and accounts, and, by these means, to spread the use of electrical energy in every direction—thus bringing in its train increased consumption, and improved load and diversity factors. It being taken for granted that, in order to fulfil the various requirements, such a tariff must consist of some form of fixed charge and low charges per unit consumed, the assessment of the fixed charge presents the greatest difficulty. Basing such charges on rateable value, floor area, estimated lighting consumption, the number of lampholders, and other arbitrary assessments, involves many drawbacks; and, in the author's opinion, some form of compromise between connected load and controlled demand appears most likely to fill the bill. He suggests that a rental based upon a "controlled-agreed" maximum demand, with a low follow-on rate per unit consumed, would meet all cases. We cannot enter in detail into Mr. Cooper's arguments. There is admission that the selection of a suitable limiter to control the consumer's agreed demand presents certain difficulties; but they do not by any means appear to be insuperable. He obviously favours an "alarm" type of limiter, fitted with a recording counter. Consumers, he says, would no doubt appreciate the facility this system would give them for checking wasteful use of cooking appliances, &c., as in "all-electric" premises the bulk of the consuming apparatus is usually under the control of servants or subordinates. The wasteful use of gas by servants in houses equipped with gas-cooking ranges is proverbial; and the alarm limiter, coupled with wiring arranged on the "alternative" switching system, would probably prove as great a boon to the consumer as to the supply undertaking. Should the application of the alarm limiter prove to be practicable, Mr. Cooper says it would give a simple method for applying a controlled demand system of charges.

Scottish Junior Gas Associations.—An invitation has been extended to the members by the Chairman and Directors of the Coatbridge Gas Company to visit their works on Saturday afternoon next (May 5).

THE BOYS GAS CALORIMETER.

It will be remembered that an outstanding feature of the meeting last June of the Institution of Gas Engineers was the lecture by Prof. C. V. Boys, F.R.S., one of the Gas Referees, on the recording and integrating gas calorimeter invented by him. On that occasion, he prepared a paper on the subject; but, as was remarked in our review of the proceedings at the time, "Prof. Boys has lived in this work so long, and knows every particle of his invention, the purpose of each part, and has gone to such infinite pains in achieving a desired end, that he delivered himself of a description of the instrument, told why he had done this and that, and the purpose of every part, with a fluency and completeness that fascinated those present." Therefore, when the announcement was made that he was to lecture last Friday evening, at the Royal Institution, Albemarle Street, W., on "Measurement of the Heating Value of Gas," a further treat was confidently anticipated; and it is safe to say that his audience were not disappointed.

The Royal Institution was founded more than a hundred years ago by Count Rumford, who was a great expositor of the science of heat; and it was the home of Davy, Faraday, Tyndal, Lord Rayleigh, Sir J. J. Thomson, and Sir James Dewar, who recently died. This made it an appropriate place in which to explain so difficult a scientific problem as that with which Prof. Boys had to deal. He described what he described at the Institution meeting already referred to, and elucidated his points by the exhibition of several excellent working models. The first illustrated one of the mysteries of the epicyclic gear—representing on an enormous scale one of the gears in the "thinking machine," which directs the axle of the meter to rotate at a proper rate. Another was a model of the gear employed for working the recording drum of the "thinking machine." The third showed the "brain" of the "thinking machine"—the actual integrator. A fourth showed the construction, mounting, and drive of a recording drum of the "thinking machine," in which the paper of the drum, resting by its weight on the threads of a revolving screw, causes it to turn once a month. There was also thrown on the screen an image showing the working of his new meter drum, all made transparent for the purpose, so that those present might see its construction.

During the whole of the time that has elapsed since last summer, Prof. Boys has had the calorimeter running, and under observation; and, as a result, he has introduced one by one a number of changes which, though they are minor alterations, are nevertheless of quite serious importance. It will be of interest to state exactly what these improvements are.

The Operative Thermometers.

The first of the changes made is in connection with the operative thermometers, which Prof. Boys has remade so as to stand on two feet, with a rigid base, and with what may be called an accordion type of upper end. These give a more rigid expansive movement than the diaphragms previously used.

Insulating Shield.

The highly-conducting copper shield round the hot-water compartment, which for the calculation of its effect required the use of hyperbolic functions, has been replaced by a copper shield, round which the escaping warm water circulates; and this is insulated within and without.

Meter Temperature.

Prof. Boys has put a coil of copper pipe within the water chamber of the meter, through which all the cold water in circulation is passed, so as to maintain the meter strictly at the temperature of the rest of the apparatus. Before this, during changes in temperature, the meter temperature used to lag behind more than was desirable.

The Metallic Support.

The cold water circulation is also taken through channels in the casting on which the base of the instrument is bolted. This is very important, in view of the change from a wood to a metallic support. As the water passes through this base after measurement, and the last thing before its temperature is taken, no disturbance of the rise of temperature can be introduced by the metallic support.

Avoiding Proving the Meter.

Then in connection with the meter, the point or points below the water level, by means of which the water level is determined, are adjustable from outside the meter casing, without interfering with the working of the meter; and when set accurately, the means of access can be sealed, and the cover also can be sealed to ensure accuracy thereafter. By this means it is confidently expected that the most tiresome of the operations—that of proving the meter—will be entirely avoided in future.

Magnifying Lever System.

The pivots of the magnifying lever system are now made of an improved design.

A Radiator of Clarkson Tubing.

The coil of composition piping, which was a mere extemporized arrangement for cooling water, has now been replaced by a small radiator of Clarkson tubing, which is much more compact.

The Paper Feed.

The paper for the machine is now fed from a roll, which may con-

tain a year's paper, and ruled and marked with days and half-hours, as before, as it passes over the recording drum; but if unattended, the paper will continue to wind itself round and round a "jack towel" type of support, taking sixteen days for each circuit. This will go on indefinitely. The paper may be taken off, however, once a week, once a fortnight, once a month, or as often as may be desired. In consequence, the machine may run a month at a time without attention, if, and when, this is proved to be an advantage. The only limit of time of non-attendance is that due to the necessity for putting a few drops of oil on the hot-air engine; and this Prof. Boys has found is not required more than once a month. For anything he knows, the engine would go even longer; but this he has not tried.

The Water Supply.

Prof. Boys has given up the use of ballcock and tap-water, as it will not be safe for continued use to allow any kind of water to be employed. His present view is that distilled water only is permissible. He has therefore designed and constructed a special form of automatic still, with air-cooled condensing pipe taken round the wall of the room. This pipe delivers its condensed water into the lower tank of the calorimeter.

In using this still, an inverted "Winchester quart" of water is placed in position, in a similar manner to a bird fountain. A small flame of gas is lighted under a jacketed boiler; and then, after a space of some eight hours, when all the water has been distilled, the gas turns itself off infallibly, and thus the user of the instrument has no trouble in providing himself with pure distilled water. About one Winchester quart a month is needed to make up for evaporation.

A Calculating Appliance.

In connection with calculations on the changes of temperature due to circulating water in the series of tanks or receptacles, Prof. Boys has designed and constructed a kind of calculating appliance based on a mathematical principle which has either not before been recognized, or at any rate utilized, so far as he knows.

The "Spot Test" Calorimeter.

Since last summer, Prof. Boys has started experiments on the "spot test" calorimeter to which he referred at the Institution meeting as being likely to prove a most convenient instrument. This, with the special small meter on his own plan, makes an accurate, inexpensive, and quickly used combination, which was shown on Friday night for the first time. With it, thermometer readings may be taken only ten minutes after lighting up, no meter proving is required, and if used for official purposes the gas examiner's labours would be lightened. Careful tests with this and the usual Boys calorimeter give identical results.

In the Library, Messrs. Griffin & Sons, Ltd., had fitted up, and set working, an example of the new recording calorimeter of their own construction, so that members of the Institution could see the instrument, in what it is hoped is its ultimate form, beautifully made and finished.

NAPHTHALENE EXTRACTION BY MEANS OF CHARCOAL.

In the course of an article which appears in the Australian "Chemical Engineering and Mining Review," Mr. E. T. Rowe, B.Sc., late Assistant Chemist of the South Australian Gas Company, gives some results obtained in an investigation on the extraction of naphthalene from coal gas by the charcoal absorption method. The method described was suggested by the Bayer process for the extraction of benzole. The charcoal used in the experiments was obtained from stringybark and from mallee; no apparent difference being noticed in the two kinds. The sp. gr. was approximately 0·5 p.ct., and the ash content 2·0 p.ct. Where possible, the experiments were made with 100 grammes of charcoal; and the gas was passed at the rate of 1 c.ft. per hour. These figures are comparable with a make of gas of 100,000 c.ft. per hour, using a 10-ton purifier.

Tests were made on the gas issuing from the purifiers; the average naphthalene content of which was 13·22 grains per 100 c.ft. The experiments showed that approximately one ton of charcoal would be required per day for the removal of naphthalene from a make of 100,000 c.ft. per hour. This naphthalene content corresponded to that obtaining in summer months; and further tests showed that during the winter much less than one ton of charcoal would be required for complete removal. These tests also pointed to the fact that sulphuretted hydrogen has a crippling effect on the purifying medium.

The maximum drop in the calorific value of the gas was 13 B.Th.U.; but the average decrease resulting from the purification by charcoal only amounted to 1 B.Th.U. per c.ft. The effect on the composition of the gas was also investigated; and a table is given of analyses taken at hourly intervals. These show that, after a preliminary decrease in the content of unsaturated hydrocarbons, very little difference existed between the purified and unpurified gas.

It is stated that, in general, it would not be economical to revivify the spent charcoal; and tests on revivified charcoal showed that its absorbing effect was only about one-tenth that of the fresh material. No estimates of the cost of the process were given, which will doubtless vary too much with locality to be accurately estimated.

THE FIXATION OF NITROGEN.

The series of three Cantor Lectures on nitrogen fixation was completed by Mr. E. Kilburn Scott at the Royal Society of Arts on Monday evening of last week.

Referring once more to the Hausser explosion process, he said the nitric oxide made by it is about 1 p.ct. concentration, or a little lower than the concentration obtained by the arc process in Norway; but, as had already been pointed out, by working at three atmospheres it is possible largely to cut down the cost of the absorption end of the plant. If this can be done with the Hausser process, it can be done with other processes, though not so easily. In the Hausser system, the work done in exploding the bomb is thrown away; but Mr. H. A. Humphrey, Chief Engineer of the Brunner-Mond plant at Billingham-on-Tees, is investigating this question. He has applied the principle of the Humphrey pump to the Hausser process. Mr. Kilburn Scott said he could not for the life of him think why this idea should not have been developed while the war was on. It is a marked advance on the work which Hausser did. It was brought out by Mr. Humphrey in 1917; and it should have been tried during the war, and ought to be tried now. There should be a Nitrogen Research Department in this country testing all suggested processes. Probably the best thing would be to combine them all.

The lecturer next proceeded to deal with the Haber and Claude processes—showing in connection with the latter a number of lantern slides. He remarked that, in the Haber process, the temperature of liquid air is raised, and the first gas evolved is nitrogen. If there is another process which requires oxygen, this is the way to get it. By passing electricity through water, electrolytic hydrogen is obtained. This is the method to adopt where there is plenty of electricity. It can also be obtained by the water-gas method; but it is then necessary completely to remove the carbon monoxide. When the nitrogen and the hydrogen are brought together by a catalytic process which combines the two gases, synthetic ammonia results—this is Haber's method. When this synthetic ammonia is obtained, a good deal of plant is required to treat it. First, it can be made into ammonium sulphate, by combining the ammonia with sulphuric acid; or the ammonia can be passed through another catalyst—which this time has to be a mesh of fairly pure platinum wire—along with the right proportion of oxygen, when nitric oxide is obtained. This process does not require so large an absorption plant as the Hausser or arc methods. Ammonium chloride may also be made, which is a coming fertilizer; and also sodium bicarbonate.

As to the Claude process, this is being worked at a pressure of 900 atmospheres, which is four-and-a-half times the pressure employed by Haber. He has thereby increased the reaction so that, instead of getting a yield of 5 p.ct., as had been obtained by Haber at 200 atmospheres, Claude secures a yield of 25 p.ct. Thus it has been shown that there are no insurmountable difficulties in producing super-pressures. In Claude's latest form of catalyzer tube, the catalyzer material fills an inner tube which has tapering walls. The gases, entering at the bottom of the outer portion of the apparatus, pass the inner tube as they travel upwards; and they are heated by the heat of the reaction in the catalyzer. The inner, or catalyst, tube is covered with a non-conducting material, which decreases in thickness from the bottom towards the top; and the thickness at each point is such that the gas will absorb the right amount of heat. In this way, the gases reach the catalyst at the top at the required temperature.

In the course of his remarks upon this aspect of his subject, Mr. Kilburn Scott pointed out that practically the world's supply of platinum comes from Russia; and therefore there is a drawback to processes which depend on platinum, so long as Russia remains in its present condition.

At the conclusion of the lecture, there was some discussion, during which certain of the statements which had been made by the lecturer were criticized.

Dr. J. A. Harker, F.R.S., said that Mr. Humphrey had got what might prove to be an exceedingly good idea into practical shape. It might be of great importance, and was worthy of further investigation. We in this country had sufficient enthusiasm to do things, not only as well as the Germans, but a good deal better. The experience of the Nitrogen Products Committee was, he believed, about to be utilized fully; and the plant which Synthetic Ammonia Products, Ltd. (the subsidiary of Messrs. Brunner, Mond, & Co.), were to put up was intended to have an ultimate output of over 300 tons of ammonia per day.

Society of Chemical Industry.—In accordance with the provisions of By-law 68, notice is given that the annual general meeting of the Society of Chemical Industry will be held in the Arts School, Benet Street, Cambridge, on Thursday, June 21. The programme of the proceedings will be issued shortly. Dr. E. F. Armstrong, F.R.S., has been nominated for re-election to the office of President under By-law 19; Dr. T. Howard Butler, Mr. F. H. Carr, Prof. G. G. Henderson, F.R.S., and Mr. Emile Mond have been nominated Vice-Presidents under By-law 20. Mr. E. V. Evans has been re-elected Hon. Treasurer; and Sir Wm. J. Pope, K.B.E., has been elected Hon. Foreign Secretary.

STOKING MACHINERY FOR HORIZONTAL RETORTS.

The Improved De Brouwer Projector and the New Williams-Jenkins Patent Pusher.

WORKING conditions in gas-works during recent years having undergone considerable modification, particularly in carbonization, it is well to note the steps taken by the leading manufacturers of stoking machinery to meet the present-day requirements.

With a view to giving the horizontal settings the greatest degree of efficiency, heavy charges are being generally adopted. It will be appreciated that heavy charges of coal can only be put in efficiently by the use of mechanical stokers; and it naturally follows that manufacturers of these machines must meet the new conditions demanded of them. Since the early part of last year, it is interesting to note the various alterations and improvements introduced into the well-known "D.B." stoking machinery by Messrs. W. J. Jenkins & Co., Ltd., of Retford, who have furnished us with the necessary photographs to illustrate the points enumerated. The accompanying illustrations, together with a general description, will be of interest to our readers.

Figs. 1 and 2 show the latest type of electrically driven complete stoking machine. The principles involved in this design are also embodied in machines of the single type—*i.e.*, separate charging and discharging machines. These machines can also be arranged to be driven by compressed air or by endless rope drive, and are adaptable to any size of retort-house.

THE CHARGING APPARATUS.

The name of De Brouwer has, of course, been associated with Messrs. W. J. Jenkins & Co., Ltd., for many years; and since the first D.B. projector was introduced by the firm in 1903, the principle has steadily been gaining favour with gas engineers, and is still regarded as an extremely efficient means of charging horizontal retorts. The simplicity and compactness of its mechanism certainly overcome many difficulties arising from the design and size of retort-house; while every shape and length of through or stop-end retort can be charged with any predetermined weight of coal without altering the machine. This apparatus, though it has proved its efficiency for many years, has, however, been improved in detail. As will be seen from fig. 3, the chief among these is the shape of the groove in the projector drum, which has been altered so as to conserve the incoming coal more into the form of a stream; thus avoiding unnecessary spreading of the coal when passing between the machine and the retort. The accessibility of the projector belt has also had the attention of the makers; and by the introduction of a very simple, yet ingenious, device, it is possible to remove the projector drum, belt, and jockey pulleys in a very short time. This is a decided advantage when it is necessary to put on a new belt; the whole operation occupying less than 30 minutes.

The main feature of this charging device ever since its introduction has been the fact that no part of the machine enters the retort; and it has been in pursuance of this feature that Messrs. Jenkins have introduced the still further improvement—namely, an extension hood. This hood commences on the exit side of the mechanism where the projector belt leaves the projector pulley, and when in operation extends to, and, in fact, makes contact with, the face of the retort. This hood is in two portions; the front half being movable and capable of sliding backwards and forwards over the back half, which is fixed. By the introduction of an operating lever with a locking device attached thereto at the platform end, the extended hood becomes perfectly foolproof inasmuch as all controls, excepting those for working the charging apparatus, are automatically locked. The operator, therefore, is compelled to withdraw his shoot to a safe position before the machine can be traversed. This hood will no doubt make a strong appeal to many gas engineers.

Another feature of the apparatus is the introduction of self-aligning ball bearings. These are introduced not only for the

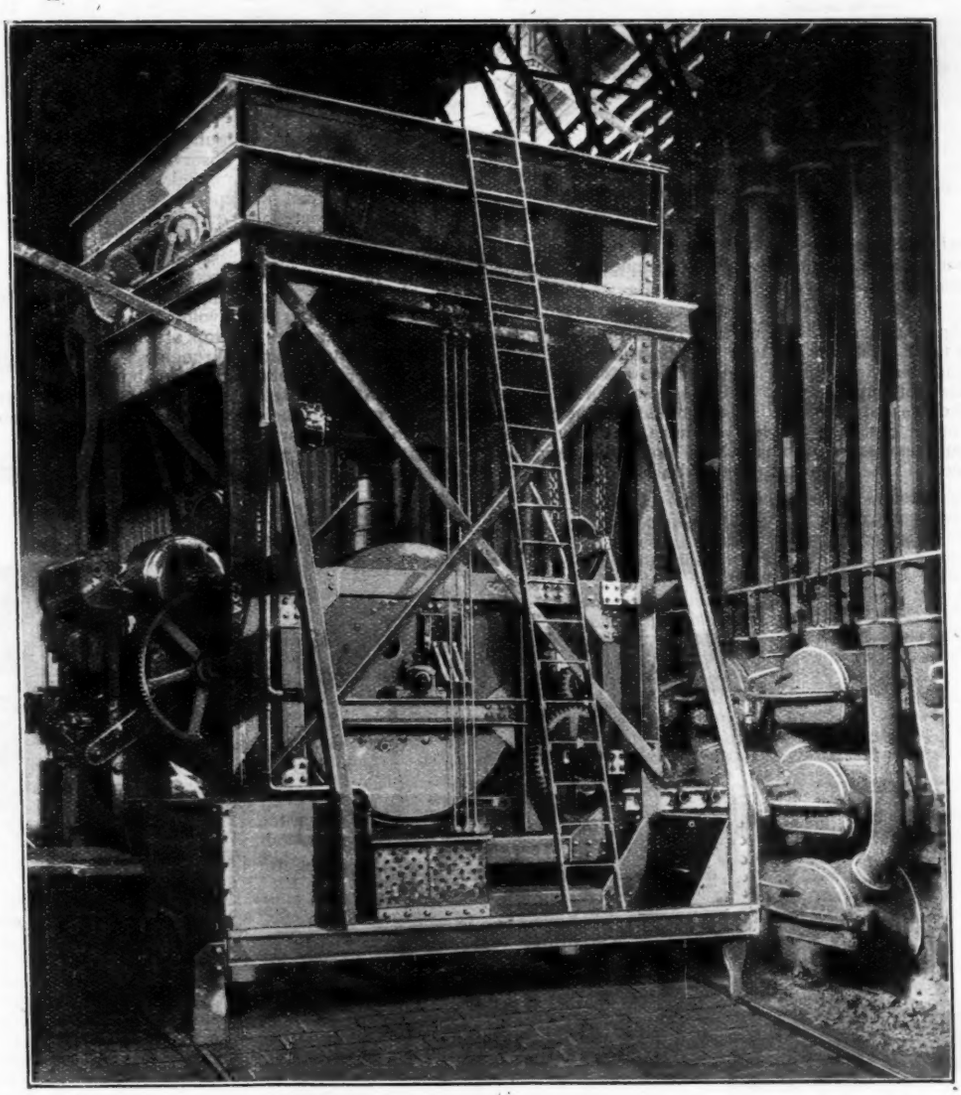


FIG. 1.—The Williams-Jenkins Complete Stoker, fitted with Self-Contained Hopper.

projector drum, but also for the three jockey pulleys, reducing the power required to drive this apparatus to an absolute minimum.

The charging machines are built in various forms to meet local conditions. The machine may be fitted with a hopper to carry 5 tons of coal to work in conjunction with a central overhead coal storage bunker, or the same machine may be equipped with an elevator for picking up the coal from openings in the retort-house wall where the coal-store is adjacent.

The machine may also carry a measuring chamber holding one charge, or a weighing chamber, in which case the weight of coal

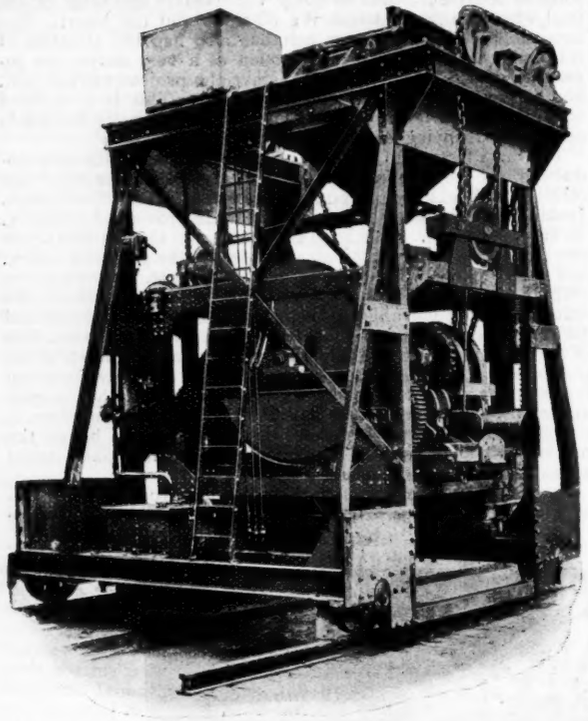


FIG. 2.—The W.J. Complete Stoker fitted with Measuring Chamber and Hoisting Safety Gear.

in each charge is indicated on a dial. In both of the latter machines they would work in conjunction with continuous overhead storage bunkers.

The Discharging Apparatus.

The discharging apparatus in question is of the Williams-Jenkins patent type, as shown on fig. 4 and diagrammatically in figs. 5 and 6, and consists of a first length of heavy section cast-steel ram. This first length is sufficiently long to bridge the space between the machine and the retort. The remainder of the pusher ram is made up of cast-steel heavy type links, and having as hinges between them massive pins, which present a very big wearing surface. These hinge pins are made of such a length that they extend equally on each side of the links, and thus form the equivalent of teeth, on which the sprocket wheel may transmit its drive.

The pusher ram is held together by means of a pitched chain, which is anchored on the first length of ram and then passes through the centre of each cast-steel link and hinged pin. It is thus totally protected in working conditions. At the other end, the pitched chain is anchored to a winding drum on which the pusher ram chain coils itself. The anchoring is by means of a powerful volute spring; the latter being introduced in order to get proper tension on the ram chain, and to allow for expansion or contraction of the ram.

The special features observed about this apparatus are, in the first place, its simplicity, and, in the second place, its total absence of catches, timing gears, &c., so common in the original type of

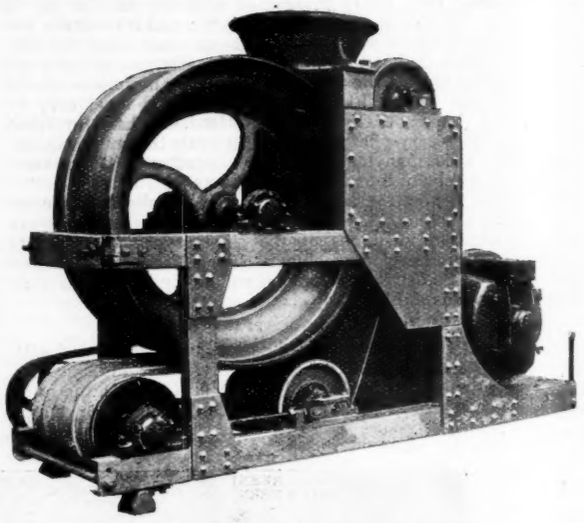


FIG. 3.—Improved D.B. Projector as Described.

discharging apparatus manufactured by Messrs. W. J. Jenkins & Co., Ltd. It is further observed that the working parts have been reduced to a minimum, and also that there is a total absence of rivets, bolts, &c., as experience has shown that these small attachments become loose under the heat to which they are subject, and give constant trouble.

The leading end of the first length of pusher ram is formed as a pusher head, which is provided with a special V-shaped horizontal shoe which ensures that the ram is the whole time getting well under the coke; thus avoiding any possibility of the pusher head rubbing against the top of the retort. The drive to the pusher ram is transmitted through cast-steel gearing and a powerful double sprocket wheel arranged above the ram. The sprockets engage with lugs or teeth cast on each side of the front length of the ram and with the heavy knuckles of the remaining portion. The principle is clearly shown in figs. 5 and 6.

On the operating platform a tell-tale finger is provided which indicates to the operator at any time, the exact position of his

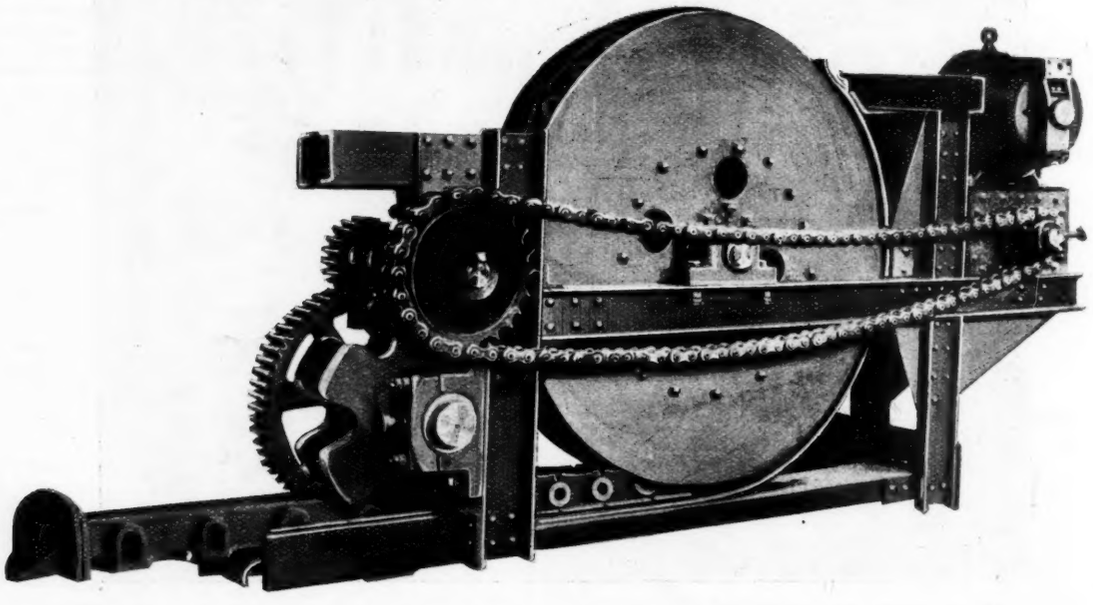


FIG. 4.—The Williams-Jenkins Discharging Ram as a separate Machine, or embodied in the Complete Stoker.

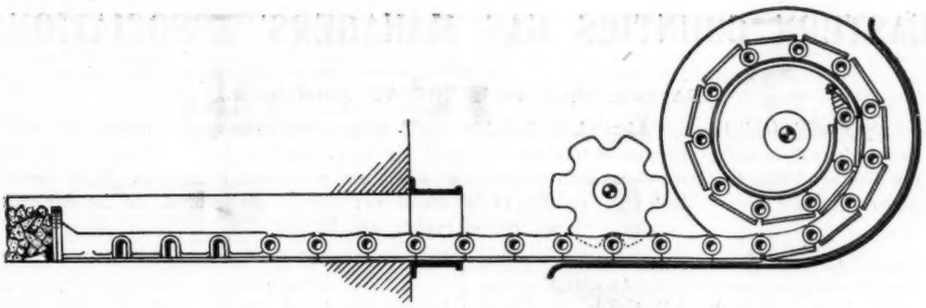


FIG. 5.—Diagrammatic Arrangement of the Williams-Jenkins Discharging Ram.

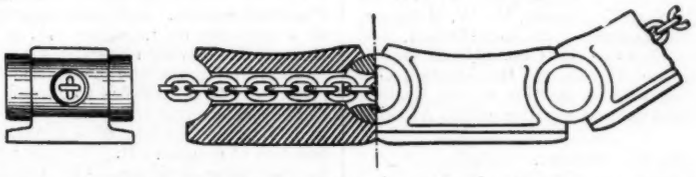


FIG. 6.—Details showing the Internal Chain and assembly of Ram Links and Hinge Pins.

pusher head inside the retort, and an automatic electric cut-out operates at each end of the stroke; thus giving the operator an extra feeling of security that he cannot over-run the ram in either direction.

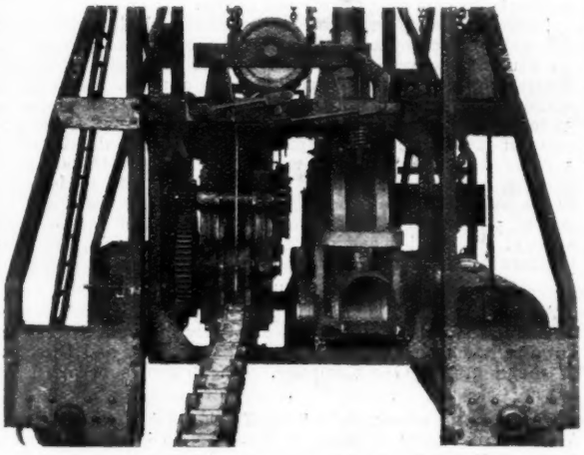


FIG. 7.—Front View of the Williams-Jenkins Complete Stoker showing the Ram extended and the Hoisting Safety Device.

SAFETY DEVICE.

The charging and discharging apparatus described above is contained in a common frame, which is moved up and down between the vertical angles of the main frame by means of hoisting chains. The possibility of securing this frame at any point instantaneously in case of accident to the hoisting chains was also under review early last year. The device evolved is shown clearly in principle and detail in fig. 7, from which it will be observed that the jockey pulley round which the chain runs is carried in a sling plate, which latter is rigidly pivoted at one end. The other end, due to the weight of the hoisting frame, is, in normal conditions, permanently kept against a stop on the hoisting frame; but it will be noticed that this end, when in this position, is compressing a very powerful spring. Thus, should a hoisting chain break, the spring is immediately given free play, when, by extending, it transmits its motion to a series of levers which instantaneously shoot-out plungers. These latter engage in cast-steel racks running in each corner angle of the main frame, and thus positively hold the hoisting frame, as shown in fig. 2.

GENERAL.

The main frame is a very solid structure; and it will be observed that the wheel base is of ample and generous dimensions, with the centre of gravity of the whole machine lying well forward; thus preventing any tendency of the machine to lift or tilt, even when operating on the top tier of retorts. These innovations should make a strong appeal to gas managers interested in stoking machinery, particularly as the actual working results have proved beyond doubt that the new design is a great improvement and a marked advance on the older De Brouwer types.

CONTINUOUS CARBONIZATION.

Recent Contracts for Glover-West Vertical Retorts.

The principle of continuous carbonization in vertical retorts is still going ahead and being adopted in all parts of the world. In many of these cases, a new model retort, which was described in our issue for Nov. 23, 1921, p. 570, is being installed. The design of this retort is a natural outcome of the long series of investigations initiated by the late Mr. John West at St. Helens, and continued in the remarkable researches of the Gas Investigation Committee of the Institution of Gas Engineers at Uddingston, and those of the Fuel Research Department at East Greenwich.

The Grays and Tilbury Gas Company are now putting in the foundations for an extension to the existing vertical retort installation at their Grays works, Essex. The eight additional retorts are to be placed in line with the existing bench; the gravity bucket coal conveyor being very conveniently extended over the new retorts. These eight retorts have a guaranteed capacity of 450,000 c.ft. per day. They will constitute the first introduction of the new model Glover-West retort in the London district.

The Malden and Melrose Gas Light Company, of Malden, Mass., U.S.A., have placed an order with West's Gas Improvement Company, Ltd., of America (Inc.) for forty of the latest type of Glover-West vertical retorts; and the Northern New York Utilities Corporation have ordered an installation of a capacity of 750,000 c.ft. per day for their Watertown Works, New York.

The recovery of the gas industry in France is marked by the initiation of several schemes for the introduction of continuously operated vertical retorts, of which three have resulted in contracts for installations of those of the Glover-West latest type. At Troyes and Le Mans, installations, each comprising 32 retorts, are in course of construction; and at Villemomble, in the environs of Paris, a small installation of eight retorts has been commenced.

In Australia, the first half of the last extension at Mortlake, Sydney, comprising fourteen settings, has been set to work, carbonizing approximately 350 tons of coal per day. The second line, containing the same number of settings, is now to be proceeded with. When it is completed, there will be Glover-West retorts installed at this works alone of a carbonizing capacity of 1400 tons per diem.

In New Zealand, the installation at the works of the Wellington Gas Company has been in operation for seven months; and the order for an extension has been placed. This will consist of sixteen retorts, with a capacity of about 1 million c.ft. per day.

Surface Combustion.—At the Royal Society of Arts, on Wednesday next, a lecture on "Surface Combustion—With special reference to Recent Developments in Radiophragm Heating will be given by Prof. W. A. Bone, D.Sc., Ph.D., F.R.S. Mr. D Milne Watson, M.A., LL.B. (Gas Light and Coke Company) will preside. An experimental demonstration of radiophragm heating will be given by Mr. F. J. Cox, M.Inst.M.E.

Canadian Coal Supply—Anthracite imported into Canada from the United States during the year 1922 amounted to 2,514,249 short tons, as compared with 4,567,370 short tons in 1921, and 4,912,964 tons in 1920. Bituminous coal imported from the United States during the year amounted to 10,924,045 tons, compared with 13,536,250 in 1921 and 15,902,632 in 1920. For the first time in many years, coal was imported from Great Britain; about 817,000 tons being received during the last six months of 1922.

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

HALF-YEARLY MEETING AT SOUTHEND.

The only possible fault that could have been found by the good muster of members at Southend last Wednesday—where they met to do honour to their President, Mr. T. F. Canning, Assoc.M.Inst.C.E., Engineer of the Southend Gas Company—was with the weather, which was somewhat boisterous. Most complete arrangements had been made for the comfort of the members; and the programme for the day, which was a full one, proved replete with interest.

The place of assembly was the gas-works, on the Eastern Esplanade; and here the members were welcomed by Mr. Canning and his Chairman (Mr. John H. Burrows, J.P., C.A.). Mr. Alfred Talbot (one of the Directors) was also present during the day; and so was Mr. James T. Randall (the Secretary of the Company). Among the visitors were noticed Mr. G. M. Gill, Mr. W. T. Dunn (Secretary of the Institution of Gas Engineers), Mr. W. M. Mason (Manager of the British Commercial Gas Association), Mr. W. J Smith (Secretary of the National Gas Council), and Mr. H. Wimhurst (formerly Engineer and Manager of the Sleaford Gas Company), who convened the original meeting in the Eastern Counties District which resulted in the formation of the Association in 1888.

Round the Gas-Works.

The Southend Gas Company have a long and encouraging history; the business having grown enormously. Glancing through a souvenir pamphlet prepared for the occasion, it is noted that gas was first lighted in the town on May 8, 1855; and success immediately crowned the Company's efforts, as the first dividend (5 p.ct., free of income-tax), for the year 1856, was declared at the second annual meeting, in March, 1857. In 1895, the Company's sale of gas amounted to 45,015,000 c.ft.; and by 1915 this had grown to 399,520,000 c.ft. Quite recently, however, the Company have purchased the Rochford Gas Company's undertaking and the Leigh Gas-Works of the Southend Corporation. The total sale of gas of the combined undertakings for the year 1922 was 794,983,000 c.ft.

A New Holder.

During the inspection of the works, many interesting features were pointed out, and others were referred to subsequently by Mr. Canning in his Presidential Address. One point emphasized by him was that the Company have reached the limit of their gas-holder capacity; and further provision has to be made. In this connection, an opportunity was afforded of witnessing the operation of pile driving on the site of the new holder, the contractors for which are Messrs. Saml. Cutler and Sons, Ltd. This will be a four-lift holder (in steel tank), with Cutler's patent triangulated guide-framing; and it will have a capacity of 2,500,000 c.ft.

The bottom and first row of tank side-plates will be erected upon timber stools of sufficient height to allow access between the underside of the tank and the foundation. After completion of the riveting and caulking, this portion of the tank will be flooded with water, and all seams and rivets tested, after which it will be lowered by a series of jacks on the permanent foundation. The remainder of the side plates will then be erected and riveted in successive tiers. The pneumatic plant to be used for riveting and caulking the tank comprises a 42-B.H.P. oil-engine, driving a compressor which delivers air at up to 100 lbs. per sq. in. pressure to the receiver and distributing hoses. The riveting machines have a 6 ft. gap, and an arrangement of pistons and toggles by means of which a steady closing pressure of up to 100 tons can be brought to bear upon the rivet. The machines weigh over 2 tons each, and are traversed upon tackles. The lifts of the holder will be built in succession from the floor of the tank, working inwards from the outer to the inner lift.

With this new holder in operation (in the summer of next year), it will be possible for the Company to store 3,800,000 c.ft. of gas, which, at the present rate of increase in consumption, will be sufficient to cope with the maximum day's output for some years; but before this time expires, extension will have to be made of the manufacturing and purifying plant, to meet the increased output.

The Plant.

A pier with accommodation for sailing barges of 250 tons extends from the works a distance of 100 yards into the sea. Coal is unloaded from barges by means of a crane and grab, which discharges into a hopper at the end of the pier. Trucks are loaded with coal from the hopper, and drawn by miniature steam locomotives along an elevated light railway to the coal stores, where they are tipped immediately above the breaker pits of the elevators. Oil is delivered direct into the storage tanks (which have a capacity of 260,000 gallons) through a 4-in. pipe line, 300 yards long, laid from the pier head. Coke, tar, and liquor are loaded into barges from the pier. The coke is loaded into trucks, and by means of the elevated railway brought to the pier and discharged through shoots into the barges. Tar and liquor are loaded into barges through a 4-in. pipe line running from the storage tanks to the end of the pier.

The coal-gas plant consists of two benches of horizontal retorts of six beds of eleven retorts 24 in. by 16 in. by 21 ft. long. The capacity of each bench, with 10 cwt. charges of eight hours' duration, is 1,250,000 c.ft. per diem. The retorts are charged and discharged by a Fiddes-Aldridge stoking machine. The coke from the retorts is discharged into trucks, and drawn by steam locomotives to the water-gas plant, boilers, and coke yard. The condensers are of the horizontal air-cooled type, built of steel tubes; and on the top of each is fixed a water spray, to assist in cooling the gas when found necessary. The washing is done by a Livesey washer, a Cockey washer, and a Kirkham, Hulett, and Chandler washer. For purifying, there are four water-lute boxes of a capacity of 1,500,000 c.ft. a day, with two catch boxes. Current for driving the stoking machine, elevator and conveyor motors, and pressure-raising fans is supplied by two Siemens generators direct-coupled to Crossley 60 B.H.P. gas-engines.

The carburetted water-gas plant comprises three Humphreys and Glasgow sets, one of a capacity of 1,250,000 c.ft. per diem, and two of 900,000 c.ft. Turbine blowers and boilers are housed in the same building. The relief holder has a capacity of 90,000 c.ft. There is one twin set of Bryan-Donkin exhausters, and one twin set of Waller exhausters. A tar extractor of the Fisher-Fiddes type is fixed on the inlet to the purifiers for removing the tar fog from the gas. The purifiers consist of two sets of four boxes of the luteless type, worked in parallel, and having an aggregate capacity of 1,500,000 c.ft. a day. The coal gas and carburetted water gas are mixed at the outlet of the station meters before entering the storage holder.

In the governor-house are two sets of electrically-driven pressure-raising fans of a capacity of 500,000 c.ft. and 750,000 c.ft. an hour respectively. The former feeds the eastern and east central portions of the district through a 12 in. and a 24 in. station governor, and the latter feeds either direct or through a 30 in. station governor the west central, western, and Leigh portions of the district—the extremity of the Leigh district being 5 miles from the Southend works. Two Bryan-Donkin compressors, each of a capacity of 50,000 c.ft. an hour, are installed in the water gas exhauster-house for pumping gas under a pressure of 5 lbs. per sq. in. into the west central and north-eastern areas of the district, and for high pressure lighting. The high-pressure is reduced in the areas referred to by Reynolds governors.

Luncheon.

After a few moments with the photographer, the members proceeded to the Palace Hotel, where a party of about seventy sat down to luncheon, as the guests of the Chairman and Directors of the Southend Gas Company. Mr. Burrows occupied the chair.

The Chairman submitted the Loyal Toast, and then extended to the Association a hearty welcome to Southend. They were, he said, always welcoming strangers to Southend. This was the way in which they grew. The daily tripper, if fortune favoured him, became the visitor of weeks; and the visitor of weeks became the resident. From just over 8000 inhabitants when he settled there 41 years ago, Southend had now grown to the considerable county borough of 120,000 inhabitants. His Company had had three or four years' service of the President; and what the members had seen that morning, he hoped, would have assured them that the undertaking was an enterprising and somewhat successful one. The Company was by no means a new institution, having been founded so long ago as 1854; and during the whole of the time that had since elapsed, with the exception of a short period while the war was on, growth had been experienced. The movement occasionally had been by leaps and bounds; and the visit of the Association had synchronized with one of the bounding phases. Four weeks ago they took possession of the gas-works for the western district of the borough, at Leigh-on-Sea, the output of which had gone up very considerably. Less than three years ago, they took over the Rochford Gas-Works; and there, again, the output had increased tremendously. And so all the way round they could show progress of a highly gratifying character. The Company owed, not the need for gas, but the fact that they were in a position to supply this need, very largely to Mr. Canning. The works which the members had seen that day were far different from those of which he took charge on his appointment a few years ago. Difficulties had met Mr. Canning every day. There had been perplexities innumerable; but by steady courage, devotion to duty, and a determination not to be beaten, he had at any rate won the approbation of the Directors, and this approbation had been given him without stint. He wished Mr. Canning a long life—in the service of the Southend Gas Company. It was the hope of the Company that he would spend the remainder of his career with them. He felt that it was unnecessary for him to say more than this in favour of their President. On behalf of the Board of the Company he thanked the Association for honouring them by being present as their guests that afternoon.

Mr. Thomas Glover (Norwich) remarked that, though there was no toast list, they would all wish to express their hearty thanks to the Chairman and Directors of the Company for the generous hospitality which had been extended to the Association. They were particularly grateful for the speech which had just been made by the Chairman, and for his high appreciation of their President. This kindly appreciation was pleasant hearing for the members of the Association who were gathered together that day under the genial chairmanship of Mr.

Burrows. They would all carry away with them a very high opinion of the health-giving properties of Southend. It was always nice on these occasions to feel that the gas company whose visitors they happened to be were appreciative of the work of the Association. The members derived a good deal of incentive from these meetings, and particularly when the chairman of the company concerned attended and offered them encouragement. From such meetings, and from the technical papers submitted, the industry had gained considerably. Nothing but good could accrue to the Southend Gas Company from their Engineer being President of the Association. The admiration they all felt for the work of Mr. Canning was emphasized when they learned that the growth in consumption had been so rapid. It was gratifying to find that Southend had sufficient faith in the future to put down another fine holder. As an Association, they wished the Company every success. They felt sure that, under the management of Mr. Canning, they would have this success, and that next time the Association visited Southend there would be further great progress to report. He proposed a hearty vote of thanks to Mr. Burrows, the Chairman of the Gas Company, and his colleagues for the generous hospitality the Association had enjoyed that day.

This was carried with applause, and briefly acknowledged by the CHAIRMAN.

Mr. CANNING said he felt that he could not let the occasion pass without expressing his personal thanks to his Chairman for so ably presiding. From the moment when the visit to Southend was first suggested, Mr. Burrows had taken the greatest interest in it. Knowing how exceedingly busy a man he was, he was more than grateful to the Chairman for so giving up his time; and also to his colleague, Mr. Talbot, who was another busy man, for being present. As to the kind remarks about himself that had been made, it was true there had been difficult times to contend with. There had been labour and other troubles, and enormous consumptions to meet; but through it all he had had the entire support of his Chairman and Directors. He had the advantage of serving under a Chairman of great ability, and a Board constituted of keen business men, who had invariably treated him in the kindest possible manner. In times of difficulty he had always enjoyed their unanimous support.

THE BUSINESS MEETING.

Subsequently, the business meeting was held in the hotel—under the Presidency of Mr. THOMAS F. CANNING.

MINUTES OF LAST MEETING.

At the outset, the minutes of the last meeting were confirmed.

THE LATE MR. HAWKINS.

The HON. SECRETARY (Mr. W. H. Mainwaring, of Lincoln) reported that he had received a letter from Mrs. Barton in reply to one of sympathy that he had written to Mr. and Mrs. Barton on the occasion of the death of Mr. J. G. Hawkins, who was one of the oldest members of the Association. They were very grateful for the kind message of sympathy.

On the suggestion of the PRESIDENT, the members signified their sympathy with Mrs. Barton in the loss of her father, by rising silently in their places.

NEW MEMBERS.

Proposed by Mr. C. G. GRIMWOOD (Sudbury) and seconded by Mr. S. HANDS (Sleaford), the following were elected:

Members.—Mr. Jesse Rose, Gas Manager to the Bourne Urban District Council; Mr. T. H. Reece, Engineer of the East Kent Gas Company; and Mr. W. C. Chapman, Assistant Engineer of the Boston Gas Company.

Associate Member.—Mr. J. C. D. Phillips, Water-Gas Department, Messrs. Saml. Cutler and Sons, Ltd.

REPORT AND BALANCE-SHEET.

The report for the year 1922 stated that ten new members were elected during the year, and that one had resigned. The Committee regretted to report the loss by death of the Rt. Hon. Sir Daniel Ford Goddard, an honorary member of the Association, and of four associate members—Messrs. T. Duxbury, F. Turner, T. Glover, and J. Randall. One member had been removed under rule 20. The balance brought forward was £37 4s. Receipts during the year amounted to £81 2s., and the expenditure to £96 11s. 10d., leaving a balance in the hands of the Treasurer of £21 14s. 2d.

Mr. H. R. WIMHURST (Bury St. Edmunds) moved the adoption of the report and accounts, along with a recommendation that £5 5s. be paid to the Institution Benevolent Fund as a donation. He remarked that the balance appeared to have been reduced during the past year; but this, he believed, was due to the expense of committee meetings in consequence of the members residing so far apart.

The PRESIDENT: That is so.

Mr. J. A. MALLETT (Ipswich) said that, as one of the Auditors, it was a pleasure to him to second the adoption of the accounts, because he knew they were perfectly correct. Reference had been made to the reduction of the balance; but the Association might congratulate themselves on having a balance of £21 to start the new year with.

The resolution was carried.

Mr. CANNING then proceeded to deliver the following

PRESIDENTIAL ADDRESS.

In addressing you to-day, my first duty is a pleasant one, and it is to assure you of the grateful sentiments I bear towards you for the honour you have done me in electing me your President. I very much appreciate your action in this matter, and more particularly on account of my comparatively recent advent to the district embraced by your Association. I desire to assure you that my one aim is to endeavour to maintain the best traditions of the Association while occupying the important position you have consigned to my care during this year.

So much has been written on retort-house practice, by such able authorities as Mr. G. M. Gill, late Chief Engineer of the South Metropolitan Gas Company, and Mr. J. S. Thorman, of the Bow Common Works of the Gas Light and Coke Company, among others, that I have some diffidence in referring to this matter at all; and my only excuse for so doing is, in the first place, a desire to testify to the great advantages and smooth working to be derived from the introduction of a thorough system of procedure and control in this department, and, secondly, to describe some of the alterations, both in the design and operation, of the carbonizing plant at Southend found to be necessary before the retort-house could be brought up to a state of efficiency.

RETORT-HOUSE CONTROL.

It may not be possible in every case to introduce in their entirety all the methods of control adopted in the retort-houses of the large gas companies; but much can be done in this direction by the application of a carefully thought-out system to meet the conditions prevailing in a works of given size. A great improvement can be made in the quantity and quality of the gas, even in a works producing only 10 millions per annum, by introducing a suitable system into the retort-house. A works of this output may be the smallest upon which it would be possible to introduce a system in this department; but upon this point I am not at present prepared to express an opinion. I can, however, testify to the advantages to be derived both from the financial point of view and in practical working, by the introduction of a judiciously applied system in a retort-house of a works producing 10 millions per annum. It is surprising to what an extent system can be introduced into this department, on so small a works, without necessitating any increase in the staff; and I have found that the men very rapidly appreciate that, by adhering to a system, their work is made less arduous; while the undertaking benefits by lessened wear and tear charges, and better all-round results.

I have found on all those works of which I have had sole charge that considerable improvement could be made in the results obtained from the carbonizing plant, either by a process of tuning-up or, as in the case of Southend, by the combination of tuning-up and necessary alterations in design. It was not possible to improve the working of the carbonizing plant at Southend until certain alterations, which I will describe later, had been made to the ironwork of the benches.

As I view it, the process of tuning-up involves the introduction of a system of working which provides for regular attention to be given to details. This does not necessarily mean an increase in the number of men employed in the retort-house, though in some instances I can imagine this might prove to be necessary. My own experience is that, in every instance except one, when no alteration in personnel was made, the tuning-up, coupled with the introduction of a judiciously applied system, resulted in a reduction in the retort-house staff; but this question of a reduction or increase in the number of men employed in the carbonizing department is really not material, when it is borne in mind that the tuning-up of a retort-house to high efficiency generally results in a substantial saving, amounting in some cases to thousands of pounds per annum, to the undertaking concerned. An increase of a few pounds per week in wages, if found necessary, to obtain this efficiency becomes a handsome investment.

In some works, the retort-house appears to be the most neglected part of the plant. In several cases which have come under my notice, the mouthpieces appeared to stare at one from what could only be described as miniature coke heaps; while gas and tar wept from neglected lids, joints, cracked mouthpieces, and ascension pipes, and crazy retorts poured rich gas into the combustion chamber and setting, assisted by the opposition of a heavy tar seal, or, what is more often the case, a hydraulic main pitched solid. Such a description may appear to some, whose experience has been more fortunate, to be exaggerated; but I can assure them that it is not. In more than one instance in my experience, I have had to remove the pitch from the whole of the hydraulic mains in the carbonizing plant with sledge hammers and road wedges. In the case of one works, some of the hydraulic mains had been red-hot; and wooden planks placed on them, to protect the pipe-jumpers' feet, were charred by the red-hot metal. In this particular works, one could push one's hand between the flanges of many of the mouthpieces and the retorts; and within two hours after charging with a 6 cwt. charge, some of the retorts were full of red-hot coke, all the gas having been consumed by the air sucked in at the leaky mouthpiece joints. A retort-house in such a condition is a nightmare to work, and needs all one's courage to bring it up to a state of efficiency. On more than one occasion, however, I have experienced the intense satisfaction of redeeming and restoring to efficiency a retort-house which at first sight seemed to be a hopeless case. These may appear to be experiences of an extreme and unusual nature. If so, then my lot has been cast among retort-houses requiring considerable attention.

AN UNUSUAL TYPE OF DIP-PIPE.

On taking-up my duties at Southend in September, 1918, I found the works, in common with other gas-works up and down the country, suffering from the effects of four years of war. The

output of gas had decreased to 403 millions from an output of 439 millions in 1914. This large decrease in consumption told heavily on the finances of a Company already burdened with a high capital, and pointed to the necessity for careful and economical management in every department.

On my first walk round the works, my attention was directed to an unusual type of dip pipe which had been installed in the retort-house as an experiment some years before the war. The arrangement is shown in fig. 1; and among the many advantages claimed for it was the prevention of stopped pipes. It will be seen from the diagram of this arrangement that it consisted of a curiously shaped hydraulic main, through one-half of which passed the ascension pipe. Over the latter was suspended a steel thimble, the lower portion of which formed a seal in the liquid in the hydraulic main. The thimble was enclosed by a cast-iron cylindrical chamber bolted to the top of the hydraulic main, and closed at the upper end by a removable flange through which passed an adjustable suspension rod attached to the thimble, and utilized to increase or decrease the seal formed by the latter with the liquid in the hydraulic main.

It will be noticed that the gas, in its passage from the ascension pipe to the hydraulic main, passed through the annular chamber formed between the ascension pipe and the steel thimble; and in order to obviate the blockage of this chamber with thick tar and pitch, small angle bars were riveted in a vertical position, one to the outside of the ascension pipe and the other to the inside of the

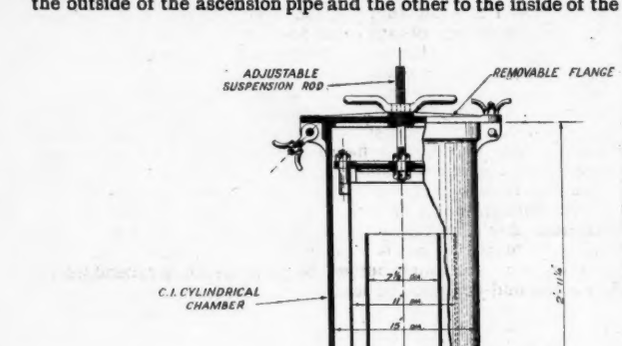


Fig. 1.

thimble. From time to time the latter was rotated by means of the spindle projecting from the cap on the outer cast-iron casing, bringing about a mutual scraping action between the thimble and that portion of the ascension pipe enclosed by it. The result of this action was the deposit of the thick tar and pitch so removed in the hydraulic main at the point where the ascension pipe entered it. An additional deposit of pitch also accumulated at this point as a result of the distillation of the tar by the action of the hot ascension pipe. In practical everyday working, this experimental dip pipe was not a success; and in a very short time after lighting-up a retort-stack, with everything clean, almost every mouthpiece would be lit-up, owing to the blockages of pitch formed round the ascension pipe in the manner described.

ALTERATIONS AT SOUTHEND.

After numerous attempts to ascertain the conditions under which this type of dip pipe would function properly, the problem had to be abandoned; and I decided to alter the system of ironwork to that in general use in the gas industry throughout the world—namely, the ordinary bridge and dip pipe. While making this alteration, I was desirous of bringing the retort-house into line with the most modern practice; and by the courtesy of Mr. G. M. Gill, I was privileged to make an inspection, under his able guidance, of the retort-houses of the South Metropolitan Gas Company at their Old Kent Road works. I was so impressed by the method I saw there of working with dip pipes unsealed, that I determined to adopt it after remodelling the ironwork of the retort-house at Southend.

The whole of the alterations were carried out by our own men. The existing hydraulic mains, with slight alterations, were utilized again, being fitted with the usual type of dip pipes. New bridge pipes and part of the ascension pipes had to be provided, and the hydraulic mains fitted with a sight-feed liquor supply and adjustable overflow to each main. New tar mains, valves, and take-offs had to be fitted, as the old arrangement for removing the tar, though good in its day, was not suitable for modern conditions. Two tar towers, made out of some spare 24-in. pipes, were erected, one to each bench of six beds; and a 12-in. retort-house governor was erected on one of the benches. The other bench was already equipped with one; but it had never been in operation for any extended period, as the system of retort ironwork precluded the use of so delicate a system of control. Although a tar tower was erected on each bench, an adjustable overflow was also fitted to each hydraulic main.

AN ADJUSTABLE OVERFLOW.

The adjustable overflow consists of a rectangular cast-iron box with an open top and three holes in the bottom; one such box being arranged to take the overflow from the hydraulic mains on one bed. Through two of the holes in the bottom of the box, 1½-in. diameter overflow pipes from each hydraulic main are introduced; the third and centre hole having a pipe connected to it for carrying away the liquor which overflows into the box. The pipe from each hydraulic main is carried up to a predetermined height inside the box, and is fitted with a running socket for making adjustments to the level of the liquor in the hydraulic main. This arrangement serves a very useful purpose by showing at a glance if there is any obstruction in the tar take-off of any of the hydraulic mains.

In normal working, all the liquor flows, by way of the tar main, into the tar tower, and thence by an adjustable type of overflow to the circulating tank. Should a tar take-off become blocked, liquor begins in a very short time to make its appearance at the adjustable overflow, and the retort-house foreman or his assistant is made aware of the trouble before there is any risk of tar in the hydraulic main becoming thick or converted into pitch. The adjustable overflow also prevents any loss of gas from back-pressure on the retorts, should a blockage occur in the tar take-off. Virtually it acts as a tell-tale, by indicating the conditions prevailing inside the hydraulic mains. When lighting-up a bed of retorts, it has a further advantage in enabling the particular bed to be temporarily sealed, by closing the tar valves on the bottom of the hydraulic mains, as a precaution against the risk of explosion from the gas in a charged retort travelling down the ascension pipe of an empty one and igniting.

In my experience, I have not found satisfactory the method of sealing a bed by merely closing the tar valve and turning-on the liquor supply; for though I admit a bed of retorts can be sealed in this manner, the period it will remain in this state is extremely doubtful, owing to the difficulty of insuring the tightness of tar valves after they have been in use for any length of time. When working with dip pipes unsealed, I prefer to take the precaution of seeing the liquor flowing away at the adjustable overflow on each hydraulic main when charging a bed of retorts for the first time after lighting-up—the overflow, of course, having been previously adjusted to seal the dip pipes.

THE SOUTHEND SETTINGS.

The settings at Southend are beds of eleven retorts, 24 in. by 16 in. by 21 ft. long, in three vertical rows of four, three, four; and each retort is fitted with one ascension pipe only of 8 in. diameter. This type of setting is unusual; but nevertheless I have found it a good type to work. The single ascension pipe is, however, not to be recommended. The maximum charge which can be put in a retort with the existing stoking machine is 10 cwt.; and this is carbonized in eight hours with a moderate temperature in the combustion chamber. I am of opinion that the best results will be obtained from settings of this type by fitting two ascension pipes to each retort, installing a stoking machine capable of putting in a heavier charge, and working at higher temperatures. These modifications would result in an increased output from the existing carbonizing plant, and would postpone extension for some time; while a better yield of residual products in both quantity and quality would be obtained.

In partly reconstructing the retort plant, an endeavour was made to accomplish this in the most economical manner consistent with the attainment of efficient results; and therefore some of the undesirable features have had to be retained, the time not then being favourable for elaborate alterations.

RECONDITIONING MOUTHPIECES.

It is well known that if stopped pipes are to be prevented and inerts kept down to a reasonable percentage, one of the essential points to be observed is that the mouthpieces have well-fitting lids which are bottle-tight. To ensure the highest standard of tightness, it is necessary to pass each mouthpiece and lid, complete with all fittings, through the fitting shop. Any attempt to reach a high standard of workmanship with the mouthpieces in position is, in my experience, futile. The procedure adopted at Southend is to remove the mouthpieces to the fitting shop when a bed is put out of action. Here the face of the mouthpiece is planed in a planing machine and the face of the lid is skimmed-up in a lathe. The lid is then transferred to a face plate, and, if necessary, hand

scraped until a one-thousandth of an inch feeler will not pass between it and the face plate. The lid is then placed in position on the mouthpiece without crossbar or lever; and if it will pass the same test as on the face plate, the remaining parts are overhauled, replaced, and adjusted, and the mouthpiece is passed for further service in the retort-house. New mouthpices are subjected to the same test upon arrival at the works, and I have yet to discover one that would not in places easily pass a four-thousandth of an inch feeler. These are dealt with in the same manner as the old mouthpieces, and are not passed for service until they pass the one-thousandth of an inch test.

No doubt to some this may appear an absurd degree of accuracy for a retort mouthpiece, but I would suggest to them that they make a preliminary trial before forming an opinion. If a retort mouthpiece is to be kept tight for any period of time, the highest economical standard of accuracy in fitting is essential. I maintain that a new mouthpiece with a four-thousandth of an inch clearance is going more rapidly to develop into a leaky one than a mouthpiece with less than one-quarter of this clearance. The tighter fitting lid demands more attention from the men, or they experience difficulty in closing it. If mouthpieces repaired in this manner are to be kept tight for any period of time, they must, of course, have regular attention bestowed upon them by the introduction of a system which provides for the cleaning of the lids and mouthpieces on every occasion they are opened.

It is not essential to purchase a special machine for reconditioning mouthpieces to the standard specified above, as most gas-works of any size possess a machine shop capable of dealing with work of this nature, and those who are not in this fortunate position can generally get their mouthpieces reconditioned at the nearest engineering works for a reasonable sum. But it is essential to specify the limits of accuracy required.

The cost of reconditioning an old mouthpiece in the manner described is 12s. 6d.; but this is saved many times over by the absence of stopped pipes and the loss of gas they entail, coupled with the lower inerts in the gas where tight mouthpieces are maintained. I have found in practice that it costs no more to work to one-thousandth of an inch than to a lower standard of tightness. The face of the lid is finished with a V-shaped edge, and this is essential if the mouthpieces are to remain tight for any considerable period.

WORKING RESULTS.

It is surprising how delicate a control can be maintained on the carbonizing plant when suitable retort-house governors are used in conjuction with unsealed dip-pipes. At Southend one 12 in. governor is fixed on each bench of six beds, controlling the vacuum to 4·10ths in. water gauge. There is no difficulty whatever in maintaining a vacuum of so fine a degree for any period of time, provided a thorough system is in operation throughout the retort-house. Continuous recording gauges are fixed on each bench to register the vacuum throughout the 24 hours, and side by side with them are fixed suitable water gauges showing the vacuum on the inlet and outlet of the retort-house governors. All these gauges are in a locked case with a glass front, so that no unauthorized interference with them is possible; while they are at all times open for inspection.

Before the ironwork on the retort-benches at Southend was altered, stopped ascension pipes were the order of the day; but since the alterations I have described were made, and a system of working introduced and strictly adhered to, stopped ascension pipes have been a thing of the past. I am a firm believer in the use of the long auger. Short augers keep only the lower portion of the ascension pipe clean, while allowing deposits to grow in the upper portion of the pipe until ultimately a stoppage occurs, when it is too late effectively to remove it, the deposit having grown, in some cases, almost as hard as the metal itself. The use of the long auger in a systematic manner prevents any accumulation of deposit on the interior of the pipe. The system in operation at Southend is to change the auger every Tuesday morning for one which has been reconditioned by the blacksmith and tested with a special gauge kept for the purpose. The auger when true to gauge will just pass up a clean ascension pipe. It is interesting to see the quantity of deposit the new auger brings down when it is used for the first time on any particular pipe, and to note the ring on the pipe after the augering has been carried out.

With the system in operation in the retort-house at Southend, a few details of which I have touched upon, and with good quality unscreened Durham coal, I have found no difficulty in maintaining a yield of 70 therms per ton of coal carbonized, whereas before the alteration to the ironwork of the benches and the introduction of a system, at times 50 therms could be obtained, but the average yield was below this. The improvement in the quality of the gas after the introduction of this system was most marked. It was impossible to control the retort-house until it was reconstructed in the manner described. Resort had to be made to producing a high-quality carburetted water gas to enrich the poor mixture coming from the retort-house, in order to provide a suitable gas for the district. The saving in the cost of gas oil alone during the first year after the introduction of the system I have referred to ran into thousands of pounds, owing to the improved quality of the coal gas.

HOLDER CAPACITY AND OUTPUT.

The relation of holder capacity to the maximum daily output and to the output during the maximum hours on the cooking load has been an interesting study to me for some time, owing to our low ratio of storage capacity to maximum day and maximum hours. It may, perhaps, sound a little strange to those who have not studied this question closely, to note the reference to the relation between holder capacity and maximum hours; but upon investigation it will be found that it is the maximum hours' demand, and not the maximum day's output, which decides the limit of holder capacity to which a company serving such a district as Southend will have to work.

There are two gasholders at the Southend works, one of an ultimate capacity of 1,000,000 c.ft., and the other of an ultimate capacity of 300,000 c.ft. The last-named holder is reserved entirely to supply the compressors for the medium-pressure supply used for reinforcing the low-pressure mains at Westcliff, in the western area of the town, and at Southchurch, in the eastern area of the town. The 1,000,000 c.ft. holder is utilized for the low-pressure supply to the whole of our area, exclusive of Rochford, which is at present supplied from the local gas-works.

For all practical purposes, our effective gasholder capacity may be taken as 1,000,000 c.ft.; and I do not anticipate that anyone will be disposed to quarrel with me on this point. Effective gasholder capacity is undoubtedly a debatable point, and in adopting the above figure I do not profess to lay down a hard-and-fast rule. For my present purpose, I must adopt some figure; and in taking 1,000,000 c.ft. as our effective gasholder capacity, I at least feel certain that I am not adopting too low a figure by any means when the conditions obtaining at Southend are considered. In every such case, it is the local conditions which must settle points of this nature, and not generalities.

The maximum daily output at Southend on Christmas Day, 1921, was 2,547,000 c.ft.; and taking the effective gasholder capacity as 1,000,000 c.ft., the storage capacity is only 40 p.ct. of the maximum day's output—a figure far below what is generally accepted as a reasonable and safe margin. It is interesting and instructive to look at this question of gasholder capacity from an entirely different point of view than of its mere relation to the maximum day's output—namely, of its relation to the output during the maximum hours. On Whit Sunday, June 4, 1922, the following were the hourly outputs of gas from the Southend works during the mid-day cooking load:

Time.	Cubic Feet.
11 a.m. to Noon	224,000
Noon to 1 p.m.	255,000
1 p.m. to 2 p.m.	234,000
2 p.m. to 3 p.m.	103,000
Total	816,000

Total daily output, 2,057,000 c.ft.

On Sunday, Aug. 6, 1922—the following day being the August Bank Holiday—the hourly outputs during the mid-day cooking load were:

Time.	Cubic Feet.
11 a.m. to Noon	235,000
Noon to 1 p.m.	307,000
1 p.m. to 2 p.m.	241,000
2 p.m. to 3 p.m.	157,000
Total	940,000

Total daily output, 2,271,000 c.ft.

From these figures, it will be seen that our present gasholder capacity is virtually only a four hours' supply when taken over the maximum cooking hours. They also show that the maximum day's output is not necessarily in every case the ruling factor in deciding gasholder capacity. It is once more a question of conditions.

In considering these figures, it must be pointed out that they are not obtained on what may be termed a "saturated load." There are several parts of our district where the pressure is weak during the cooking load; but when this deficiency is remedied, I am tolerably certain that it will not be practicable to supply the demand for gas during these hours with our present gasholder capacity, because it must be borne in mind that in no case is it possible to meet the maximum hours with a full gasholder. The breakfast load in Southend is fairly heavy (as will be seen from Chart No. 1), and is no sooner dealt with than the cooking load commences. It is fully appreciated that we have reached the limit of our gasholder capacity; and a new holder of 2,500,000 c.ft. capacity is now being erected.

AN OUTLET BLOCKAGE WITH NAPHTHALENE.

At this point I propose to make a short digression to describe an interesting experience I had with our 1,000,000 c.ft. gasholder, owing to the blocking of the outlet with naphthalene—evidently the accumulation of many years. The outlet being a 30 in. diameter main, the blockage did not make its presence felt until our cooking load began to develop to the proportions already referred to, when my attention was drawn to the fact that the electrically-driven pressure-raising fan, which is used during the cooking hours, and is of a capacity of 500,000 c.ft. per hour, had to be worked as if on full load. Upon examination of the inlet pressure to the fan during the period of the heaviest output on the cooking load, it was found to be only 5·10ths in. water gauge, whereas a simultaneous reading taken on the crown of the large gasholder was 8 in. water gauge. From these pressures and the volume of gas being dealt with by the fan per hour, it was calculated that the 30 in. outlet must be almost completely blocked.

It was obvious that the holder could not be put out of action to clear this blockage, and the town would have to be supplied

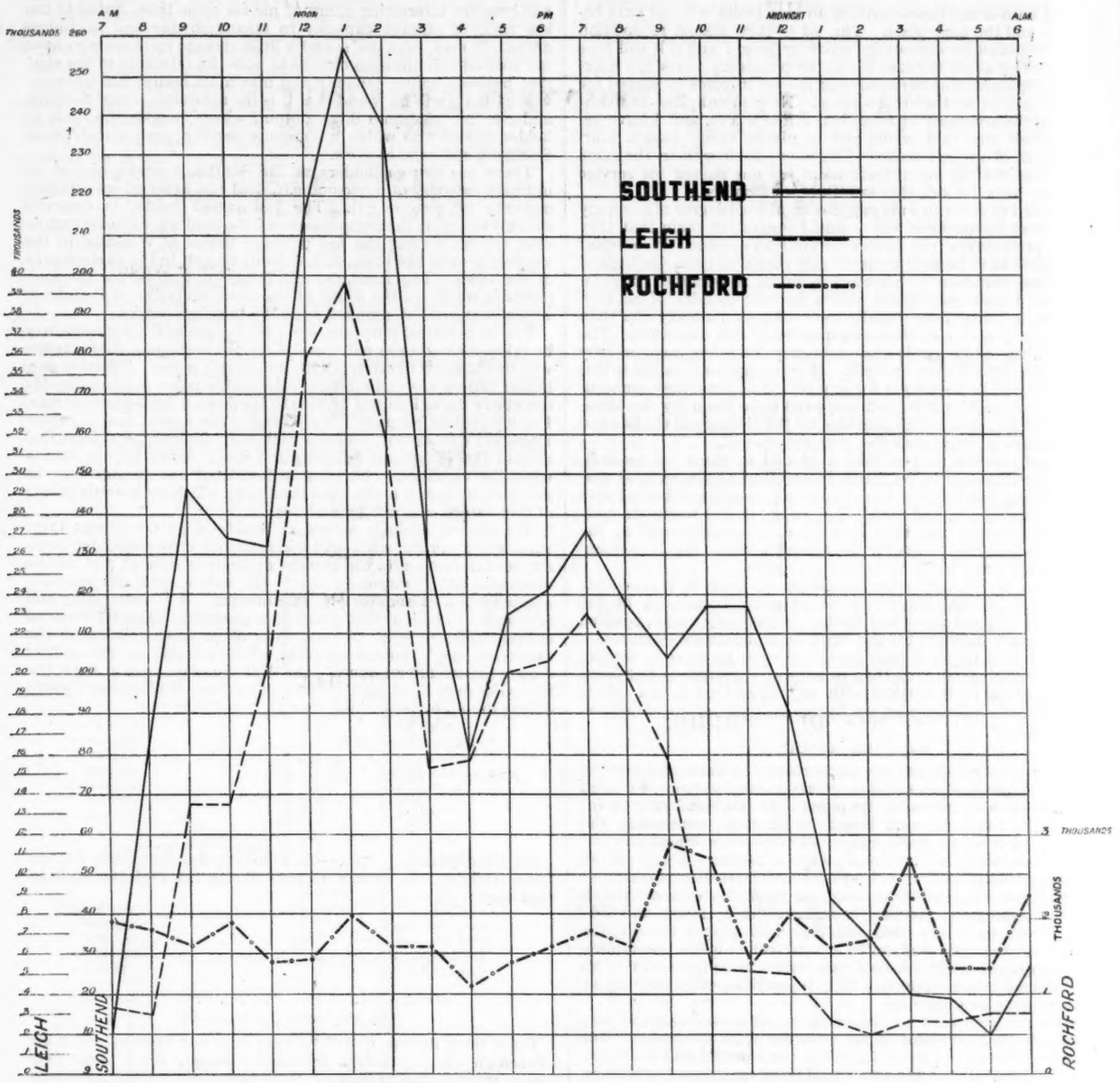


CHART No. 1.—HOURLY CONSUMPTION OF GAS DURING CHRISTMAS DAY, 1922, AT THE SOUTHEND, LEIGH, AND ROCHFORD WORKS OF THE SOUTHEND GAS COMPANY.

direct from the inlet to the holder. The only connection existing between the inlet and outlet of the gasholder was of 8 in. diameter feeding through a safety governor. This connection was, of course, quite inadequate to feed the district, except during the minimum hours of consumption. To overcome this difficulty, an 18-in. diameter rider pipe was carried direct from the gasholder inlet main to the inlet of the pressure-raising fan; and after by-passing all the station meters and closing their inlet and outlet valves, a preliminary trial with the outlet valve on the holder closed was made of this arrangement, which was found to be satisfactory.

It was anticipated that the blockage would be mainly in the bend, immediately after the outlet pipe passes from the bottom of the steel tank, and subsequent events showed this anticipation to be correct. To dissolve the naphthalene, it was decided to use ordinary gas oil, both from the point of view of efficiency as a solvent and the ease with which it could be handled from the storage tanks on the works. The efficiency as a naphthalene solvent of ordinary gas oil of the quality used for carburetting water gas is, of course, well known; but in order thoroughly to satisfy myself that it would deal with naphthalene deposits in bulk, tests were made with it on very hard naphthalene deposits in bends and elbows cut from ancient service-pipes. Some of these deposits were so hard from the constant use of the force pump that they could hardly be cut with a penknife; but after forty-eight hours' immersion in a small vessel of gas oil, without any stirring or disturbance whatever of the liquid during that period, the naphthalene was completely dissolved, leaving the metal as clean as on the day the service was laid.

Having thoroughly satisfied myself in this manner as to the efficacy of gas oil as a solvent for naphthalene in a bulk deposit, a steam-pump was fitted on a pipe line from one of the oil storage tanks, and connected to the outlet main of the gasholder; a second steam-pump, but of larger capacity, being arranged to pump the oil back to the storage tank when required, or in case of an emergency. The gas oil was pumped into the outlet main to a height of 12 ft. above the bend, as at any greater height oil would have reached the holder outlet valve in the governor-house, and, leaking through, would have flooded the connections. After leaving the oil in the outlet main for one week, it was pumped out, and the pressure, when taken on the inlet of the pressure-raising fan during the maximum hour, was found to be normal; the drop in pressure between the gasholder and the fan being only 1 in., in place of 7½ in. before treatment with the gas oil.

To find the outlet of the only gasholder large enough to give an adequate supply to the town blocked with naphthalene to such an extent was, I must confess, somewhat disconcerting. But on quietly considering ways and means of clearing it promptly, the idea of the gas oil occurred to me; and after testing it in the manner described, I felt considerably reassured. The relation of this incident may be helpful to others who are troubled in a similar manner.

CONSUMPTION STATISTICS.

The maximum day's output at Southend is 2,500,000 c.ft., and occurs on Christmas Day. The output between the maximum hours of 11 a.m. and 3 p.m. on the cooking load on Christmas Day, 1922, was 842,000 c.ft.; whereas, with a total output of 2,271,000 c.ft. on the maximum summer's day, the output between the maximum hours of 11 a.m. and 3 p.m. on the cooking load was 940,000 c.ft. In round figures, the maximum hour's output during the cooking load on the maximum winter's day is 33·6 p.ct. of the total daily output, whereas on the maximum summer's day

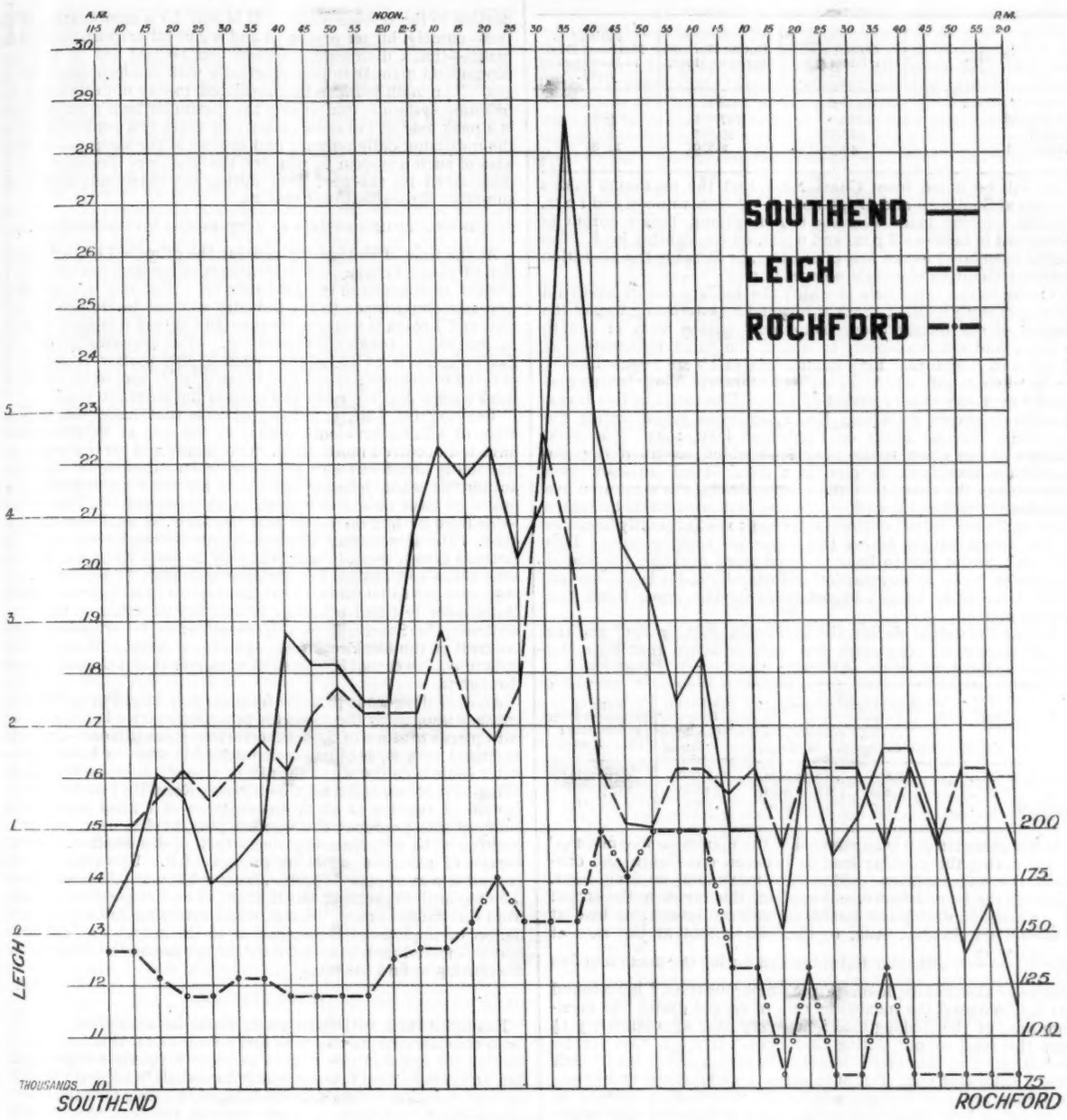


CHART No. 2.—GAS CONSUMED OVER 5 MINUTES PERIODS DURING MAXIMUM HOURS, 11 A.M. TO 2 P.M., CHRISTMAS DAY, 1922, AT THE SOUTHEND, LEIGH, AND ROCHFORD WORKS.

it is 41·3 p.ct. On a saturated load this percentage would be considerably increased, leaving little or no gas in the holders for the remaining period of the day. It will be seen, therefore, that in a town like Southend, patronized by a large number of visitors in the summer months, and having a large residential population, with no industrial undertakings, the holder capacity is governed, not by the maximum day, but by the maximum hours during the cooking load on the maximum summer's day.

Two charts have been prepared—No. 1 and No. 2. No. 1 shows the hourly consumption of gas during Christmas Day, 1922, for the Southend, Leigh, and Rochford works. The charted outputs have been plotted to different scales in each case on the same chart, in order to bring their characteristics in close comparison with each other. Chart No. 2 shows the five-minute outputs during the maximum cooking hours from 11 a.m. to 2 p.m. on Christmas Day, 1922, for the Southend, Leigh, and Rochford works. In this case the charted outputs are likewise plotted to different scales on the same chart for convenience in comparing their characteristics. The scales of gas output, it will be noted, are plotted vertically at the sides of the charts, and marked with the name of the respective works; while the horizontal scale deals, of course, with time in each chart.

It will be observed that the hourly outputs from Southend and Leigh follow one another closely, but in neither case is the cooking load a saturated one. More especially is this the case in the Leigh district, where, virtually, trunk mains do not exist. Rochford shows a rather different state of affairs. The breakfast and mid-day cooking loads follow closely those of Southend and Leigh; but beyond these there is little in common between them. Here there is no electricity, so the comparison with Southend and Leigh, though on the small scale, is perhaps somewhat interesting. With a maximum output of 42,590 c.ft. on Christmas Day, 1922, the output between the maximum cooking hours of 11 a.m. and 3 p.m. was 6631 c.ft., or only 15 p.ct. of the total output. This at first sight would appear to indicate the necessity for canvassing the consumers in the Rochford district with regard to the installation of cooking apparatus; but such is actually not the case.

The local conditions at Rochford are influenced by two factors—the absence of electricity and the existence of a large workhouse. When comparison is made between the load during the lighting hours at Rochford and those at Southend and Leigh, it will be seen that the cooking load at Rochford on the percentage basis is rendered small only on account of the magnitude of the lighting load. As a striking example of how widely local conditions may vary, I would direct your attention to what can only be described as a peak load, on the Rochford line, in Chart No. 1, occurring at 3 a.m. The explanation of this large output at so unusual an hour in a quiet country village, is that the last task of the attendants at the workhouse before going off duty at 4 a.m. is to wash the old people, and the Institution is lit-up for this purpose.

Southend, with an annual output of 730,000,000 c.ft., and a maximum day of 2,500,000 c.ft., gives a ratio of annual output to maximum day of 291. Leigh, with an annual output of 94,000,000 c.ft., and a maximum day of 323,000 c.ft., also gives a ratio of 291; but in the case of Rochford, with an annual output of 10,750,000 c.ft., and a maximum day of 42,509 c.ft., the ratio of annual output to maximum day is 253. Taking the ratio of the output during the maximum day to the output during the maximum hour, the values tabulated below are obtained:

Works.	Output on Maximum Day.	Output During Maximum Hour.	Ratio of Maximum Day to Maximum Hour.
	C.Ft.	C.Ft.	
Southend	2,501,000	257,000	9·73
Leigh	323,000	39,625	8·15
Rochford	42,509	2,869	14·8

It will be noted from Chart No. 1 that the maximum hour's output at Southend and Leigh occurs between 12 noon and 1 p.m. on the cooking load, whereas the maximum hour's output at Rochford is between 8 p.m. and 9 p.m. on the lighting load. The ratios calculated above are interesting, as showing the alteration brought about by electrical competition.

Owing to the rapid rate at which the holders fall at Southend during cooking hours, I thought it would be interesting to plot the output of gas during every five-minute period from 11 a.m. to 2 p.m., and simultaneously to obtain the same information at Leigh and Rochford. Five-minute intervals were selected owing to the obvious difficulty of obtaining accurate readings from a gas-holder over any shorter period of time. The result of this investigation is shown on Chart No. 2, and was taken during the maximum cooking hours on Christmas Day, 1922. The main feature of the chart is the peak load which occurs during the maximum hour from 12 p.m. to 1 p.m. It will be seen, upon reference to the chart, that the output during the maximum five minutes at Southend is 28,677 c.ft., and multiplying this by twelve gives an hourly output at the rate of 344,124 c.ft., greatly in excess of the actual output during the maximum cooking hour. This point is a useful one to bear in mind when deciding the size of booster to instal in any particular instance, and it is also an important factor to be considered when laying down trunk and service mains.

Taking the output during the maximum cooking hour and the output during the maximum five minutes within that hour, the ratios tabulated below are obtained:

Works.	Maximum Five Minutes.		Maximum Hour (12 to 1 p.m.) C.Ft.	Ratio of Maximum Hour to Maximum Five Minutes.
	Cubic Feet.	Time.		
Southend . . .	28,677	12.35 p.m.	257,000	9 (nearly)
Leigh	4,806	12.30 p.m.	39,625	8·24
Rochford . . .	199	12.50 p.m.	1,590	8 (nearly)

In the cases cited, it is apparent that the maximum five-minutes' output during the cooking load is between one-eighth and one-ninth the consumption during the maximum cooking hour. Adopting the former figure, and applying this factor to the output of 307,000 c.ft. during the maximum hour on the cooking load at Southend on Sunday, Aug. 6, 1922, an output at the rate of $\frac{307{,}000 \times 12}{8} = 460{,}500$ c.ft. is obtained during the maximum five minutes of the cooking load. From numerous tests, I have found that for Southend the maximum rate of output during the maximum hour of the cooking load is in every case approximately $1\frac{1}{2}$ times the total output during that hour. It must, however, be pointed out that this factor is obtained on a cooking load which is not a saturated one. But even when the alterations and extensions that are now being made to the distribution system at Southend to fully meet this demand are completed, this factor will not, in my opinion, be materially altered in the upward direction, because the deficiency in pressure during the maximum cooking hours is confined to small areas only, and is not experienced throughout the whole district of supply.

The question of providing an adequate supply during the period of maximum demand is of the greatest importance to all those engaged in putting their distribution systems in order to comply with the minimum permissible pressure prescribed by sub-section 2 of section 2 of the Gas Regulation Act, 1920; for it is obvious from the analysis of the output of gas during the maximum cooking hour shown on Chart No. 2 that mains laid down of a capacity calculated on the maximum hour's output, and with a reasonable margin allowed for growth of consumption in the district concerned, may fail to maintain the statutory pressure during the five-minute peak load of the maximum hour. A simple analysis of the maximum hour's output similar to Chart No. 2 will supply all the information required for any particular district.

From Chart No. 2 it is clear that, under section 2, sub-section 2, of the Gas Regulation Act, a minimum pressure of 2 in. water gauge must be maintained in all pipes of 2 in. diameter and upwards during the maximum five minutes of the peak load during the maximum hour. The whole matter reduces itself to this; and to carry it out the distribution system must be designed in such a manner as to fulfil this requirement.

It is obvious from the nature of the outputs plotted on Charts Nos. 1 and 2, that the first essential of a modern distribution system is that it must be flexible; and, secondly, it must be adequate to deal fully with the maximum five-minutes' load. Flexibility can be given to a distribution system by the application of suitable pressure-raising devices operated in a manner and at a time best calculated to maintain a sufficient pressure throughout the entire district of supply during the hours of maximum demand; but these devices alone will not make a distribution system adequate in cases where the trunk mains are not in proportion to the service-mains. It is only by a combination of the two—namely, higher pressures and a correct proportioning of the mains—that a distribution system can be laid out in the most economical manner to cope efficiently with modern demands for gas. The main point to be considered to-day in designing a distribution system is that during the maximum hour's output there is a peak load in the same manner as there is a peak load during the maximum daily output; and the test of the adequacy or otherwise of such a system is whether the statutory pressure can be maintained on the peak load during the maximum hour's consumption throughout that system.

INSPECTION OF MAINS, FITTINGS, AND APPARATUS.

At the time of writing this address, the proposed official inspection of mains, fittings, and apparatus is uppermost in the minds of most of us engaged in the gas industry. That this is a matter of first-rate importance to the industry will not be denied by anyone, and I think it will also be generally agreed it is high time the matter was thoroughly thrashed out. If an organization like the gas industry is to be strengthened in this matter, it should be granted protective powers, and those powers should be exercised from within, and not from any outside bureaucratic control.

The surprise, I think, to most of us is that, under the existing state of affairs, accidents similar to the one at Bethnal Green have not occurred more often. Our mains and service-pipes are frequently interfered with in an indiscriminate manner by other authorities when opening the roads for their own special purposes. I have no desire to pose as a scaremonger in this matter—far from it; but do let us face the facts, as we know them to exist. The surrounding of a gas-main with brickwork, as in the Bethnal Green case, is unfortunately a fairly common practice with those responsible for building manholes in roadways, and instances are to be found in the districts of most gas companies. Quite recently I had occasion to call the attention of the Local Authority in Southend to this practice; and I insisted on the removal of the brickwork from one of our mains which they had built into a sewer manhole in such a manner that it passed directly through it.

Another dangerous practice frequently indulged in by the men engaged in opening the roads for other authorities is the plugging with pieces of wood of mains and service-pipes pierced with picks and road wedges, or of gas-mains drilled in error as water-mains. After some time the wood shrinks or rots, or is disturbed in the filling-in process, and a leak develops. Recently I had the satisfaction of running to earth an employee of a local undertaking guilty of this practice; the wooden plug, having been placed in position when wet, shrunk during a spell of dry weather, when an escape of gas soon made its presence felt. Upon opening the ground it was at once apparent, from what was laid bare, where the responsibility rested; but in many cases the locating of a leak from this cause is most difficult, often involving the exposure to danger of the lives of those residing in the neighbourhood, while much time and money is expended by the gas undertaking in endeavouring to find the cause.

A SUGGESTION.

Examples such as I have given could be multiplied; but the main consideration to-day is to find a remedy for this evil, and in seeking for one it is essential to examine carefully every suggestion advanced. One remedy which immediately suggests itself to most of us is that it should be made legally binding for each undertaking having authority to open roads in the area concerned to notify every other undertaking in that area, and possessing similar powers, of its intention so to do, by giving three days' notice in writing. This procedure would entail hardly any additional clerical work on those undertakings who already have, under existing legislation, to give notice to the local authority in their area of their intention in this matter; the modified procedure involving nothing more than a multiplication of this notice. Notice having been served in this manner on the undertakings concerned, it will then rest with each one to look after its individual interests in seeing that none of its property laid under the roadway to be opened is interfered with or damaged in any respect during the progress of the work, and at the same time examination can be made of the works exposed. When roadways have to be opened in an emergency, notice could be given by telephone or telegram, and confirmed in writing at the earliest opportunity.

NOTIFICATION OF ESCAPES.

With regard to the notification of escapes, I think it is the experience of gas undertakings generally that every assistance is afforded by the police, who are to be highly commended for the prompt manner in which they make such reports. Further valuable assistance could be rendered by the general public in reporting escapes, and means should be adopted to impress upon them the importance of this matter through the medium of suitable propaganda. One obvious suggestion would be to enclose with the quarterly gas account from time to time a suitably worded "Safety First" circular, pointing out, in the first place, that gas of itself, when properly and intelligently used, possesses no dangers whatever, but when allowed to escape unburnt it may become a danger to life from explosion or asphyxiation. Proceeding, the obligation resting upon every individual to report immediately any escape to the gas undertaking could be emphasized, and finally full instructions given as to how and where to

report. Slot consumers would receive a copy of the circular from the collector from time to time.

This question of the education of the general public up to reporting escapes must, of course, be carried out with discretion, and only after the most careful consideration of ways and means. For instance, to placard indiscriminately a town with "Safety First" posters about gas, would obviously do more harm than good, and most probably create a panic. In an educational campaign of this nature, the first essential must be to do justice to the commodity we produce, by impressing firmly and indelibly on the minds of those we are educating that the proper and intelligent use of gas possesses no dangers whatever; secondly, to make it perfectly clear that all escapes are dangerous; and, thirdly, to give full instructions as to the mode of notification, with precautions to be taken to obviate risk of explosion or asphyxiation, if the escape is in a closed building, until the representative of the gas undertaking arrives.

In the case of the inspection of fittings and apparatus on consumers' premises, we are, I fear, up against a very difficult problem, requiring the deepest consideration before any step is taken in the matter. If the Government or a municipal authority undertook the work of inspection, they would, of course, have to take a great portion of the responsibility; and their usual policy is to avoid doing this.

THE LEGAL STATUS.

Before adopting any suggestion for inspection of consumers' fittings and apparatus, it is essential, in the first place, to have a clear idea of our present legal status in this matter; and, secondly, to consider what effect any modification of our present attitude will have upon that status. This is not a question that can be settled by engineers alone; competent legal advice must be sought and taken. It may sound very nice, and appear what is termed a "clear-cut decision," to plump right away for compulsory inspection and powers to deal with refractory consumers; but such a proposal requires the gravest consideration—the remedy may be worse than the disease. Plenary powers in this direction may mean that far-reaching responsibility is thrown on the gas undertaking for every defective pipe, fitting, and apparatus at present existing in its area of supply, most, if not all, of which have been fitted by persons outside the employ of the undertaking concerned. The gas industry has no intention or desire whatever to shirk its responsibilities to the consumer; but it certainly does refuse to shoulder the responsibility for shoddy work carried out by some of the so-called gasfitters which exists in the areas of most undertakings.

No, this is no matter for a snap decision; and I do not pretend to be able to offer any solution. At the moment, I should feel strongly inclined to adopt the method in operation in the district of at least one gas company I know of, and that is to inspect and recommend under notice in writing that such inspection is carried out, without the acceptance of any responsibility on the part of the company; and any recommendation made to the consumer, as the result of such inspection, with regard to the condition or mode of fixing of any pipe, fitting, or apparatus, is confirmed in writing. If the consumer fails to carry out the recommendation of the company, and a fatality occurs, then documentary evidence can be produced at the inquest exonerating the company from all blame. This method of dealing with the matter appears to be quite satisfactory, so long as the consumer adopts a reasonable attitude; but when the reverse is the case, it hardly leaves those in charge of an undertaking with a comfortable feeling, when it is within their knowledge that one or more of their consumers are running unnecessary risks in the use of gas.

I have recently had experience of a case which is a striking example of what an unreasonable attitude a consumer can adopt in a matter of this nature. The consumer in question wrote stating that the gas-pipes in his house were in a dangerous condition, and hung in festoons on the walls and ceilings—remarking that, if all internal pipes were laid in the same manner, he wondered how it was there were not more accidents. An inspector called, and found the festoons, as anticipated, to consist of compo. pipe installed by an outside gas-fitter—the Southend Gas Company never having installed anything but iron pipe. The consumer was informed that the Company would remove the compo. pipe and replace it with iron pipe at cost price, when he promptly refused to have the work carried out. If this is a sample of the attitude that will be adopted by some gas consumers to recommendations for their own safety, then it would appear necessary for gas undertakings to take some steps to enforce them. Evidently some gas consumers, like some individuals, require to be protected against themselves; and if the law steps in in the latter case, why not in the former?

This apathy on the part of some consumers is, I fear, the weak spot in any form of inspection where no power exists to enforce recommendations made for their safety. It only requires one fatal accident to happen in a case of this nature for the Coroner's Jury to add a rider recommending that power be given to gas undertakings to enforce their recommendations for the safety of the consumer, and the whole question will, in all probability, be re-opened. This will, of course, be most undesirable from every point of view. Now is the time to settle this matter once and for all. It is admittedly a very knotty problem, but with due time for full consideration not impossible of solution in a satisfactory manner.

In writing these few remarks, I do not suggest for one moment that modern gas is any different from what has been supplied hitherto—we all know it is not. Certain neurotic newspapers would like the general public to believe that it is different; but in this I think they have signally failed. Gas is too useful a servant, and too great a labour-saver in the household to-day, to have its reputation readily damaged in this manner. The "odourless gas" and the "poison gas" about which certain newspapers have endeavoured to raise a scare, exist only in the fertile imagination of a certain type of modern journalist. Gas as supplied to-day contains nothing different from what it did when first supplied over a hundred years ago. Nevertheless, we are all agreed that due care should be exercised in the manner of its use; and in this connection it can be said at once that gas undertakings generally are meticulous in the care they take to prevent their consumers exposing themselves to any risk in this direction.

As an example of one step which I have taken at Southend for the protection of our consumers, I reproduce below a copy of the "Safety First" card which is issued in the form of a folder to all our gasfitters. The initial letter of each paragraph is printed in red, and reads vertically downwards "Aim at 100 p.ct. efficiency":

SAFETY FIRST.

NOTHING IS GOOD WHERE BETTER IS POSSIBLE.

Always remember that as an employee of the Company your first duty is to safeguard its consumers.

In all cases of escapes, make sure you find the *seat* of the trouble. Meters are liable to other than coin slot and dial leaks. When in doubt, disconnect and thoroughly examine the case.

Meters should on no account be tested with a naked light. Soapy water will find the trouble without any risk of accident.

All work entrusted to you should be carried out in a manner which leaves no ground for complaint.

" That is good enough," should not be sufficient for you. Be satisfied with nothing less than, "That is absolutely right."

100 p.ct. of satisfied consumers is our aim, in attaining this object YOU can assist.

Every complaint, no matter how small, is worth attention.

For the safety of all concerned, never leave an open end. Plugs and caps are provided, use them, even where a tap is provided.

Forms of "Non-admittance" are provided for you; their use is a safeguard to yourself and the Company.

Inform your Inspector of any case brought to your notice where a consumer is dissatisfied.

Consumers appreciate a careful and considerate workman; see that YOUR services are worthy of appreciation.

Impress on consumers the risk they are taking by the use of "water-slide" pendants and geysers fixed without flues.

Every main cock should be provided with a key—if necessary provide one.

Never take the risk of causing damage to ceilings through nailing down boards. Remember screws can be used.

Care must always be taken to obtain the consumer's signature in the space provided on your sheet. This is important to all concerned.

You are asked to realize that careless and shoddy work on your part may have serious consequences, and might easily result in loss of life.

N.B.—The foregoing notes must be carefully studied and strictly adhered to by all.
Any employee guilty of carelessness will be instantly dismissed.

Separate and special instructions are issued with regard to escapes, and, in common with all other gas undertakings, they are given instant attention, and take precedence of all other work.

VOTE OF THANKS TO THE PRESIDENT.

Mr. W. W. TOWNSEND (Colchester) said he had great pleasure in moving that the best thanks of the Association be accorded to the President for his address. Everyone would agree that the address showed Mr. Canning to be one of the coming men of the gas industry. It was full of suggestions which proved that he had thought out things for himself. Mr. Canning had revealed himself as a thoroughly progressive engineer. If any confirmation of this were needed, their visit to the works that morning would afford it. He congratulated the President upon what he had achieved at the works, as well as upon his address. ["Hear, hear."] It was evident that the mind of a real engineer had been brought to bear upon the various problems. It was a thoroughly well planned works and thoroughly well kept, and was a credit to the Engineer and to the Company. It was a special pleasure to him to propose this vote, as he thought he was the first to welcome Mr. Canning to the district, and to suggest that he should take an active part in the Association's proceedings. Mr. Canning had been with them only a short time; but he was in charge of one of the principal works in the district, and it was only fitting that he should take his share in work which was for the benefit of all of them. The name of Canning, so well known in the gas industry, had been worthily upheld on the present occasion.

Mr. F. M. PATERNOSTER (Felixstowe), in seconding the vote, thanked the President particularly for his remarks on the subject of distribution. There was more about distribution in the address than they had heard for a long time. Many members would be grateful to him for his thoughts on the altered conditions of gas supply to-day.

The PRESIDENT thanked the members heartily for their kind reception of what he felt to be rather a poor attempt on his part

to maintain the traditions of the Association. He had had a good many misgivings since the time when he was first approached to take up this important position. Mr. Townsend had made some personal remarks, which he appreciated very much.

GAS UNDERTAKINGS AND INSPECTION OF FITTINGS.

Mr. TOWNSEND said it was not usual to discuss the President's address; but the last matter referred to was of such outstanding importance that the Association might consider the desirability of having a special meeting to consider it. Really it was a vital question; and he did not think much time ought to be allowed to go by before coming to a decision as to what they wanted. The authorities were already discussing the matter.

The PRESIDENT said it had been arranged by the Committee that this portion of the address should be discussed if he were willing. He was quite willing, provided there was time to do so after the reading of Mr. Walmsley's paper.

RECONSTRUCTION AT GREAT YARMOUTH.

Mr. P. D. WALMSLEY, B.Sc. (Engineer and General Manager of the Great Yarmouth Gas Company), then read a paper on "Reconstruction at Great Yarmouth," which, with some notes of the discussion to which it gave rise, will be found on p. 285.

NEW OFFICE BEARERS.

The following office bearers were then elected:

President.—Mr. E. F. Keable, Gorleston.
Vice-President.—Mr. F. A. West, Newark.
New Members of Committee.—Mr. J. W. Auchterlonie, Cambridge; and Mr. J. B. Hansford, Bedford.
Auditors.—Mr. G. A. Mallett, Ipswich, and Mr. W. S. Venner, Brentwood.
Hon. Secretary and Treasurer.—Mr. W. H. Mainwaring, Lincoln.

Mr. WALMSLEY, proposing Mr. Keable's election as President, said he knew him to be a thoroughly conscientious and hard-working man.

Mr. E. W. SMITH (Chelmsford) seconded, with the remark that he was certain Mr. Keable would fill the office with credit to himself and to the Association.

Mr. KEABLE, returning thanks, said that, though young in years, he was quite an old member of the Association, which he joined in 1905.

PLACE OF NEXT MEETING.

It was agreed to leave the Committee to decide the place of next meeting.

REPRESENTATIVE ON THE INSTITUTION COUNCIL.

On the proposition of Mr. KEABLE, seconded by Mr. PATERNOSTER, the President (Mr. Canning) was elected to represent the Association on the Council of the Institution of Gas Engineers.

ANNUAL DINNER.

In the evening, the annual dinner took place in the Palace Hotel, and was largely attended. The President was in the chair; and the speeches were interspersed with some excellent musical items. After the honouring of the Loyal Toasts,

Mr. J. H. BURROWS proposed "Success to the Eastern Counties Gas Managers' Association." He asked whether they were quite sure, if the matter was looked at in the right manner, that there was not still some of the old monopolistic spirit left. Nothing of the kind would do to-day. The whole of this idea would have to be removed. They ought to try to be of even greater service to the people than they already were, and perhaps incidentally do a little in the way of augmenting dividends—and there might also be a small reflection in the way of increased salaries. [Laughter.] He was a great believer in the gas industry. He believed it was going to last for very many years to come—probably for centuries. Great, however, as was the good that their industry had done for the people, he was persuaded that it could do even more; and therefore their reward, and his reward, was not what it ought to be and what it might be. He coupled with the toast the name of their President, of whom he had spoken in terms of appreciation earlier in the day.

The PRESIDENT, replying, said he had never been connected with a gas company in which the relations with the municipal authorities were so pleasant as they were in Southend.

Mr. H. G. RUGGLES (Leighton Buzzard) proposed "The County Borough of Southend."

The MAYOR (Councillor W. Miles), in reply, congratulated the Association on their choice of President. In Southend they believed always that only the best was good enough for them. They had long come to the conclusion that in Mr. Canning Southend possessed a Gas Manager equal to any in the country. Reference had been made to the growth of Southend. It might astonish them to know that if they traversed the streets and highways within the confines of the borough, they would have to travel a distance of 107 miles. It gave them some idea of the magnitude of the Gas Company's work, when they realized that there were 20,000 houses in the town, most of them connected up with the gas-mains.

Mr. P. D. WALMSLEY proposed the "Southend Gas Company," congratulating them upon their marked progress, and commenting favourably on the low price of 4s. 5d. per 1000 c.ft. charged for gas.

Mr. BURROWS replied, and expressed the hope that there would be a still further reduction in the near future.

The last toast of the evening, that of "The President," was proposed by Mr. E. F. KEABLE.

AT THE "VERITAS" MANTLE WORKS.

On Thursday morning a party of members who had remained in Southend overnight journeyed (along with the President) in motor coaches to the "Veritas" Incandescent Mantle Works at Wandsworth, where they were the guests at luncheon of Messrs. Falk, Stadelmann, and Co., Ltd.—Mr. Max Falk (the Chairman of the Company) presiding.

Mr. MAX FALK submitted the Loyal Toast, and then extended a hearty welcome to the members of the Association. He said that in going over the factory they would have ample opportunity of seeing how the industry of manufacturing mantles was carried on. The Association represented a very great industry; the power of gas was not yet sufficiently understood by the people of this country. It was a fact that the attacks upon gas had been met in a most triumphant manner; and the industry to-day was more powerful than ever. The mantle makers relied on the gas engineers to place good, cheap gas at the service of the public, to enable the consumer to use the mantles produced. There was every reason to be proud of the records and achievements of the gas industry. Gas had an indispensable place in the homes of the people. Personally, he had been associated, and his firm had been associated, with the gas industry for over forty years. He recalled the days of the flat-flame steatite burner, then the argand burner, and later the Welsbach incandescent mantle—since which time the gas industry had never looked back. He hoped those present would carry away very pleasant recollections of the afternoon's visit. He proposed the health of the President, who, he said, deserved well at the hands of the industry he served.

Mr. T. F. CANNING acknowledged the toast, and proposed a hearty vote of thanks to Mr. Falk and his co-Directors for their kind invitation. Personally, he had looked forward with considerable interest to the visit. He had used the firm's mantles for many years, and knew their quality; and therefore he was desirous of witnessing the process of manufacture of the mantles in which he had so much confidence. The existence of such a large factory as this, devoted to the one purpose, was one of the best proofs they could have of the vitality of gas to-day, in spite of the keen, and sometimes unfair, competition of electric lighting. He understood that the factory was designed for an annual output of no less than 20 million mantles. It was very gratifying to reflect that one factory alone was putting out such an enormous number of mantles. One point which he would like to emphasize was that the interests of the gas industry and of the mantle manufacturers were more or less identical. If they were to maintain the lighting business which they had at present, they must give the consumer a good article; and from this point of view the aims of both were the same. If there were to be placed on the consumer's burner an inferior mantle, it would result in the gas undertaking being condemned. Whatever went wrong, the consumer had only one complaint, "Bad gas." It was therefore to their interest to support firms who supplied a good article like the "Veritas" mantle. Mr. Falk had said that the mantle makers relied on gas engineers to produce good gas at a cheap price. Well, gas engineers also relied upon the mantle makers to produce the best mantle at the lowest price.

Under the guidance of Mr. Max Falk, Messrs. Wild and Morgan (Joint Managers), Mr. Manson (Engineer), Mr. Godfrey (Chemist), and other members of the staff, the works were then thoroughly inspected, and the intricacies of the precise and delicate operations of mantle making fully explained. The completeness and the extensiveness of the factory were commented upon; and in connection with the former point, it may be mentioned that even the menu for the luncheon and a description of the works were printed on the premises—there being a complete type-setting department for labels and work of a like kind. Thoroughness, also, was everywhere apparent.

The factory, which occupies a floor space of 90,000 sq. ft., and possesses the most up-to-date plant for gas-mantle manufacture that it is possible to obtain, occupies an area of 6½ acres. The derelict buildings of the old M'Murray Paper Mills were taken over by the present owners, Messrs. Falk, Stadelmann, and Co., Ltd., in March, 1919. It was necessary to double the size of the existing buildings; and as the result of the firm's energy, in spite of the difficult times prevailing, they were able to commence manufacture in October of that year. The "Veritas" factory is now designed for an annual output of 20 million mantles, and employs about 500 workpeople.

The raw materials used are: (*a*) Monazite sand, which is found mainly in Brazil and Travancore (S. India). From this thoria is extracted, and converted into thorium nitrate. (*b*) The tschuma plant, a native of the plains of Yang Tse Kiang in China, possesses a fibrous layer underneath the bark. From this is spun ramie thread, which forms the carrier of the thorium nitrate and other chemicals, during the course of manufacture. The thorium nitrate, together with 1 p.ct. of cerium nitrate, and about ½ p.ct. of hardening chemicals, is dissolved in distilled water (in a stoneware tank) and weighed into bottles. The ramie yarn is knitted in long cylindrical stockings on specially designed machines in many widths and textures from different qualities of thread. As the finished mantle assumes the shape and texture of the stockings, the size and strength depend on the size and strength of the knitted stocking. The ramie contains mineral matter and grease, which are next removed. If this were not done, a tendency for holes to appear in the finished mantle would result.

The washing is in reality a chemical process, and consists of dissolving the foreign bodies out by prolonged soaking in dilute acid, and then subjecting the hose to alternate rinsing with distilled water and centrifuging. From this stage onwards, the manufacture of the upright and inverted mantles must be considered separately.

The washed ramie is next cut into strips, a good deal longer than the finished mantle is to be. One end is then strengthened mechanically by doubling a piece of gauze round this portion, and sewing it in position. For upright impregnation, these stockings are soaked in a bath containing the impregnating fluid, and are passed through rubber rollers set at a definite tension, varying

with the quality and size of mantles being made. This ensures that a constant weight of fluid is left behind in the mantle. They are then drawn on to *papier maché* forms, and dried. Inverted impregnation takes place directly after washing. The hose is similarly impregnated in long strips, dried, and then cut to size.

The head of the upright mantle is strengthened once more, by impregnating it with a solution of hardening chemicals. The head is pleated, and an asbestos thread is drawn through, which is then tied into a loop. The mantles are afterwards branded. Inverted sewing is done either by machine or by hand. For machine sewing, one end of the mantle is pleated, and impregnated ramie thread is drawn through. The other end is tied on the ring with asbestos string; and the mantle is then branded. The mantle is turned inside out, the ends tied together, excess of impregnated thread cut off, and, after turning back, the pleats are smoothed out, and the mantle is folded and boxed. This method gives rise to a "spider"—*i.e.*, a small bunch in the bottom of the mantle. The weight of this might be a cause of weakness in a small mantle, which, therefore, is sewn by hand. In hand sewing, the mantle is tied on the ring and branded, and the top is unravelled slightly, then drawn together, and sewn-up with impregnated thread, giving a spiderless base.

The portion of the inverted mantle round the ring is strengthened by a similar method to that described in the case of the upright mantles. The upright mantles are drawn sharply over wooden forms, to open out the base. They are then suspended from iron hooks, and ignited at the head. Amidst considerable shrinkage, a chemical ash consisting of oxides of thorium and cerium is formed, which is first shaped by hand, and then hardened on a machine fed by a gas-air mixture under considerable pressure. The inverted mantles are suspended in iron trays, and similarly burned off. Shaping and hardening in this case can be carried out on one machine. Both upright and inverted mantles are next dipped in a solution of collodion, and are then dried. This covers them with a glossy protective film, and renders them transportable.

The mantles are then sorted and packed. In the case of upright mantles, they are first gauged and trimmed to size. They are put up in outers each containing a dozen. These then pass to the despatch department, where they are packed in cases. To ensure that the high standard of quality found in "Veritas" mantles is always maintained, samples of the work passing through the factory are taken at regular intervals, and submitted to drastic tests, both as regards their behaviour under vibration and on the burner. Should any samples prove to be defective, search is at once made for the trouble, so that it can immediately be rectified. If any such samples should show a bad result on testing, the batch from which they are taken is not sent out. The factory is well equipped with a large and up-to-date box-making plant.

RECONSTRUCTION AT GREAT YARMOUTH.

By P. D. WALMSLEY, B.Sc., Engineer and General Manager of the Great Yarmouth Gas Company.

[A Paper read before the Eastern Counties Gas Managers' Association at Southend on April 25.]

The object of the present paper is to describe briefly the reconstruction work carried out at the Yarmouth Works and to give results of every-day working (not test runs) obtained from the new plant, in the hope that these results may be of use to members who may be contemplating the installation of new carbonizing and (or) other processes.

Soon after the writer's appointment to Yarmouth in July, 1919, he laid before his Directors a scheme for the remodelling and reconstruction of the works; and following this, it was decided to proceed at once with the carrying out of the recommendations which it contained. The complete scheme comprised the following work forming the subject of contracts, as well as a very large amount of work carried out by the Company's own staff and local labour:

(1) New retort-bench complete with charging and discharging machinery, coal elevators and storage bunker, coke conveyors, coke bunkers, and screening plant.
(2) Blue water-gas plant of a capacity of 500,000 c.ft. per day (at present being converted to carburetted water-gas plant).
(3) Two gas-driven electric generating sets to run in parallel; each of 32½-KW. capacity.
(4) New 60,000 c.ft. per hour station meter replacing an old 17,000 c.ft. per hour meter installed in 1869.
(5) New sulphate of ammonia plant having a capacity of 1-ton of dry neutral sulphate per 12 hours.

The principal works carried out by the staff of the Company were:

(1) Mechanical engineering shop, smith's shop, lavatories and mess rooms, stores, and chemical laboratory.
(2) New electric power-house.
(3) Water-gas plant building and blower room.
(4) Water-gas meter house.
(5) Rebuilding sulphate house on the same site.
(6) Hydraulic engine house and pump room.
(7) Reconstruction of exhauster house.
(8) Plant for complete distillation of tar.
(9) Benzole plant for provision of benzole from light oils obtained in tar distillation, for the Company's lorries.
(10) Concrete tar-storage tank having a capacity of 90,000 gallons.
(11) Conversion of fish-curing house to motor garage.
(12) The whole of the works have been drained, paved in places, and roads and concrete footpaths made round the various buildings.

One of the most important points to be decided at the outset was the type of carbonizing plant to be adopted. The then existing carbonizing plant consisted of two stacks of six beds of retorts; six of these beds contained eight retorts each, two contained seven retorts each, all of the shallow regenerator type, and the remaining four beds were of the old direct-fired type. All the retorts were 20 ft. long, and of 21½ in. x 15½ in. oval ∩ section. The retorts were heated by furnaces on each side of the stack, and were very extravagant in fuel consumption. The charging and discharging was done by West's compressed-air stoking machinery installed in 1898; a charging and a drawing machine operating on each side of the bench.

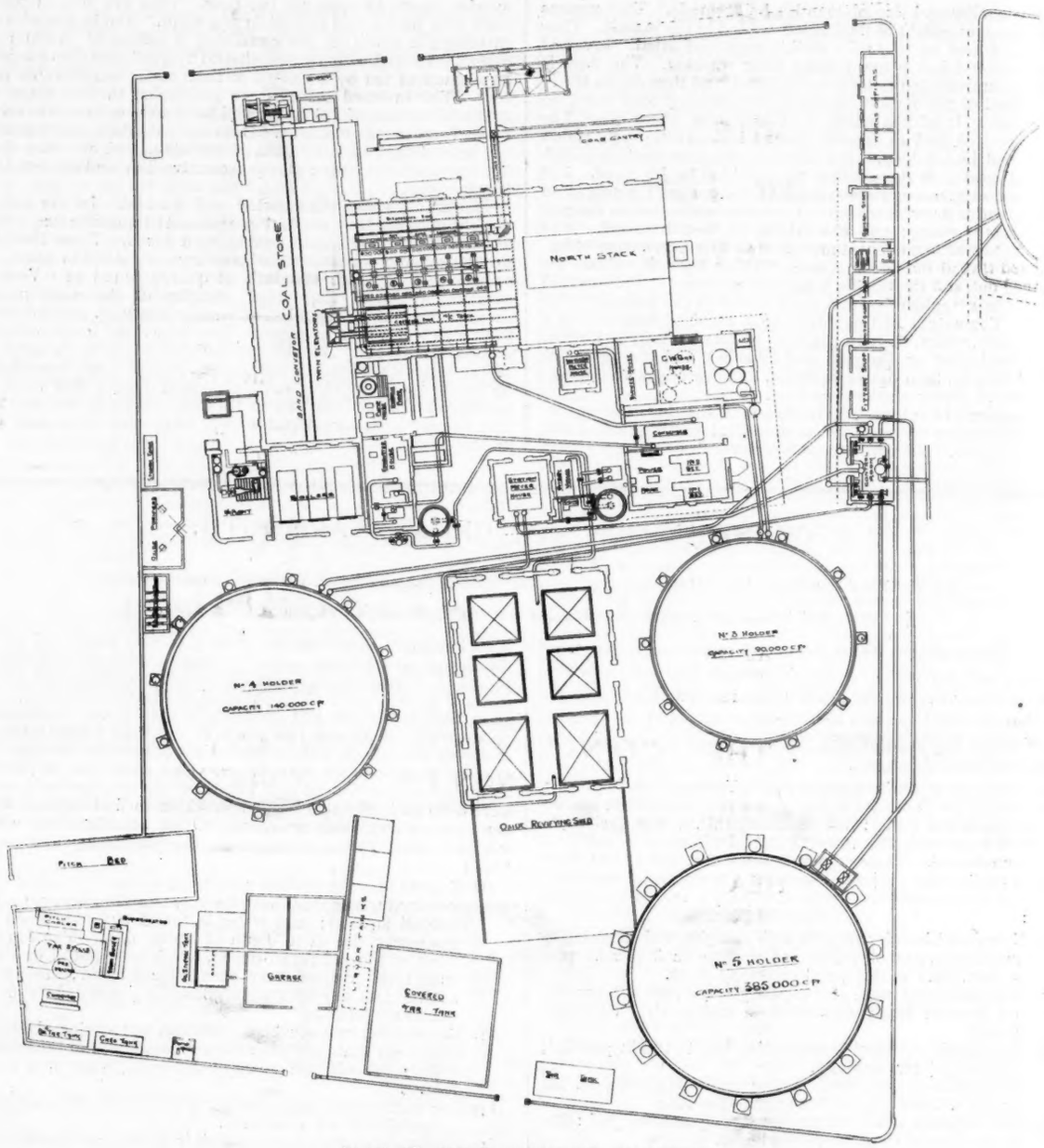
After most careful consideration of all the circumstances, it was decided to instal modern horizontal retorts of large section. The important consideration (among others) which led to this decision was that in our case the excess capital expenditure involved in the various schemes for vertical retorts could not be justified by the results to be obtained contrasted with the results from horizontals. It was unfortunate that it was imperatively necessary to carry out this work at the time when prices of materials and labour were at the highest point since the armistice, and the excess capital expenditure, which could not be justified by results at that time of high prices for gas and residuals, would have been an intolerable burden on which to find interest when more normal conditions prevailed. Other considerations which weighed materially in arriving at the decision to adopt horizontals were:

(1) Foundations for vertical retorts on a new site would have involved the expenditure of a very considerable sum. The subsoil is sand; and water is found everywhere on the gas-works site at a depth of about 6 ft. The foundations of the old retort-bench, which were put in in a very substantial manner, have been utilized again; this saving at that time anything from £8000 to £10,000 for foundations for verticals.
(2) The existing coal-crushing, elevating, and storing plant, and coal store could not have been incorporated in the scheme without the addition of extra conveying plant of a costly nature.
(3) The existing elevating machinery for feeding the coal storage-bunker could be utilized.
(4) The existing retort-house, which is of very substantial construction, could be utilized by simply raising the roof.

With the above parts of the scheme already in existence, it is not surprising that the estimated cost of verticals was more than twice the cost of horizontals. Having decided to adopt the latter, the question arose as to the best means of carrying out the work consistent with safety of the gas supply and limiting any expenditure on temporary arrangements to the minimum. If you refer to the plan of the works, you will see that the retort-house contains two stacks of retorts, with the coal-store running at right angles at the south end. The south stack was the most modern of the carbonizing plant (although itself very old) and the main source of supply. It consisted of six beds of eights on the regenerative principle; while the north stack consisted of four beds of direct-fired settings and two shallow regenerative sets.

For the writer's peace of mind, and to reduce the risk of failure of the gas supply, it would have been easier to reconstruct the north stack and retain the greater producing capacity of the south stack. But in view of the cost of excavating for the installation of regenerators, under-pinning the retort-house walls, the provision of costly foundations in uncertain ground, probable water troubles, and the provision of temporary elevating plant for feeding the hoppers of the charging machines, it was decided to take the risk of reconstructing the south stack, and to rely on blue water gas and the production of coal gas from the direct fired sets and one half of the south bench.

Orders were placed in February, 1920, for the carbonizing plant, electric power plant, and blue water-gas plant; and it was imperative that the blue water-gas plant and the power plant for the operation of the water-gas blowers should be ready for work by the end of the following June, to meet our season's demand when half of the south stack was put out of commission. The old direct-fired settings, which had been discarded as worn out in 1898, were put into working order and were brought into use.



PLAN OF GREAT YARMOUTH GAS-WORKS.

Three of the six settings of the south stack were demolished, and the erecton of two of the new settings put in hand. When it is remembered that Yarmouth is a seaside town depending largely for its prosperity on the influx of visitors in the holiday season, and the consequent demand for gas for cooking, the anxieties of the following months may be imagined—the then existing plant being only capable of meeting in a very indifferent manner the demand at that time, which is the smallest during the year. In view of the difficulties of obtaining steel plates and sections and electrical appliances at that time, our contractors for the power plant (The Keighley Gas and Oil Engine Company) and the water-gas plant (Messrs. Humphreys & Glasgow) did some remarkable work; and one section of the power plant was ready for work just in time for the increased demand.

The starting-up of the blue water-gas plant enabled us to carry through the season until the first section of the coal carbonizing plant (two beds) and the charging machine were ready, which they were in the following December.

I propose now to describe briefly the various items in the completed scheme, and to refer to any special features as the description proceeds.

Carbonizing Plant, Coal and Coke Conveying Plant.

The retort-bench consists of five through arches, 8 ft. 6 in. wide and 20 ft. through, each containing six retorts 24½ in. by 18½ in. section by 20 ft. long. The furnaces are fitted with Meade's grates; and in connection with each furnace there is a Gibbons and Masters' patent tube regenerator. There are 7 in. ascension pipes on each side of the bench; and each side of the bench is fitted with the usual type of tar tower. The charging and discharging maching is of the Guest-Gibbons type; and is supplied with coal from an overhead 60-ton coal hopper fixed on the south gable of the retort-house. This, in turn, is supplied with coal by means of twin bucket elevators from the coal store adjoining, which are so arranged that they may be run singly or together. These twin bucket elevators previously existed as dwarf elevators feeding the machine hoppers of the old West compressed-air charging machines; the elevators being lengthened by the insertion of about 40 ft. of lattice casing in each string, and the appropriate extra lengths of chain and buckets. By a slight modification, the gearing was adapted for drive by electric motor instead of by the small steam-engine previously in use. The gearing and other mechanism was thoroughly overhauled; and all bearings were melted, recast, and machined on our own works. It is fitting here to point out the great advantage of having an engineering workshop on the works. Taking advantage of the numerous Disposals Board sales, we have fitted-up a complete engineering workshop at a very small cost, which has been recouped many times over.

At this stage, I should like to call the members' attention to a form of drive which we have introduced in connection with these twin elevators. Originally the drive from the electric motor was by means of a cast-iron pinion on the motor shaft engaging a cast-iron spur wheel. On the same shaft as the spur wheel is a belt pulley forming the main drive. This arrangement was very noisy and led to serious complaints from surrounding occupiers of property; and in place of the cast-iron pinion, a raw-hide pinion was tried. This certainly reduced the noise to some extent; but raw-hide pinions are costly, and have not a very long life. The raw-hide pinion and spur-wheel drive have now been done away with; and a rocker-joint chain drive made by the Westinghouse Morse Chain Company, of Letchworth, has been substituted. This

is practically noiseless, and is satisfactory in every way. Friction and wear are reduced to a minimum; and the whole drive is of the most robust construction. Also, the cost is very moderate. The elevators may now be run during the night, which prior to this was not possible without serious complaints.

In the old retort settings, the depth of the cellar floor to the yard level was only 5 ft. 9 in.; and as it was not possible to go deeper on account of water, the stage floor of the new bench was raised 5 ft. 3 in. The stage is approached by ramps on each side of the house. To accommodate this greater depth of regenerator furnace and to give greater headroom on the top of the bench, the retort-house roof was raised bodily by 12 ft.; making the height to the eaves from the yard level 32 ft. instead of 20 ft.

The coke as discharged from the retorts is conveyed by a trough conveyor of the usual type to an inclined elevator, which conveys the coke to the concrete coke-bunkers, over which is fixed a revolving screen to grade the coke into "large" and "broken," and at the same time to take out the breeze.

In the operation of the complete carbonizing plant, including elevation of coal from the coal store to storage of coke in the coke bunkers, two stokers per shift are employed on two shifts of eight hours each in the twenty-four hour day; and a third man on each of these shifts attends to the furnaces, keeps the cellars and retort-house clean, and does any other odd jobs about the carbonizing plant. This arrangement holds whatever the number of beds at work; the minimum being three beds and the maximum five. The weight of charge averages 17 cwt.; and the carbonizing period of twelve hours gives a throughput of 10 tons 4 cwt. per bed per day.

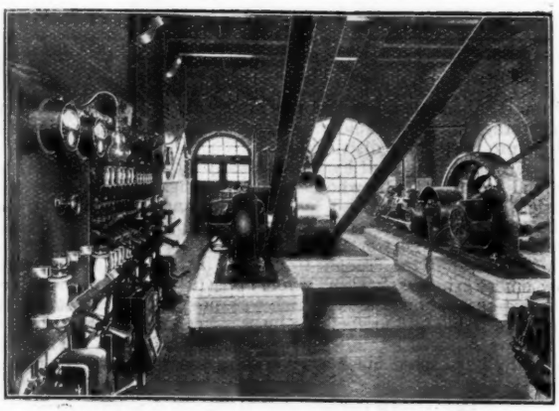


Fig. 1.—Electric Power Generating Plant.

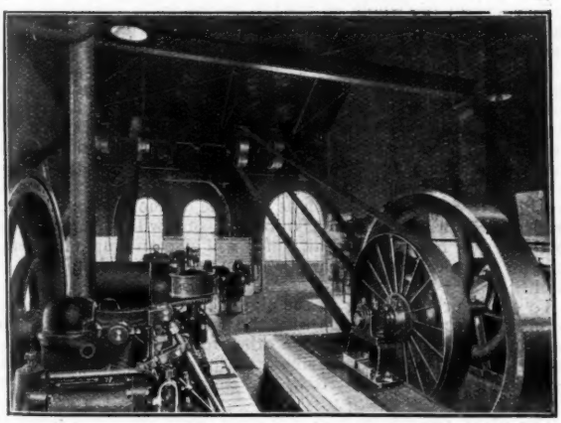


Fig. 2.—Electric Power Generating Plant.

BLUE WATER-GAS PLANT.

This plant was installed essentially as a part of the scheme of reconstruction; it being a mere circumstance that we could not have carried out the coal carbonization scheme without its aid. The plant, erected by Messrs. Humphreys and Glasgow, has a capacity of 500,000 c.ft. of gas per day; and was designed to admit of easy conversion to the carburetted type at a later date. This is being done at the present time. The plant is housed in a light airy building of substantial design, erected by ourselves and so arranged that a complete duplicate carburetted set can be installed, if required, at a future date. The Sturtevant blowers, in duplicate, are driven by 20 H.P. electric motors direct coupled. The original motors were of Belgian manufacture, as no English makers could be got to look at the order for delivery in the time required. They proved unreliable and unsatisfactory; but they served to meet the emergency. They have since been replaced by reliable machines of English make.

ELECTRIC POWER GENERATING PLANT.

In deciding on the form of motive power—gas or steam—for the generation of electricity required for the charging machine, &c., it was decided to adopt gas-engines for the following reasons:

(1) We must practise what we preach—why advocate gas in gas-engines to our customers if we do not follow the practice ourselves? For this reason it was decided to make the power house something in the nature of a show place, so that potential users of gas-engines could be shown the use of such engines in actual work.

(2) The cost of generation was less. This may not be so if the whole of the steam required for the works can be generated by waste coke breeze; but in our case we have not nearly sufficient breeze to meet our requirements for sulphate making, water gas, hydraulic power plant, &c., and saleable coke (or purchased fuel) would have had to be used, which would make the production costs greater than if gas were employed.

(3) High-speed steam-engines are not an unmixed blessing; and it was considered that the reliability of the modern gas-engine is equal to that of high-speed steam-engines.

The main power-generating plant consists of two 55-B.H.P. Keighley gas-engines operating two 32½-KW. electric generators; and there is a small 8-H.P. generating set which is used to supply power to the engineering workshop, &c., and for lighting at night when the main power plant is not at work. The lay-out of the plant is, I think, novel; the object being to obtain as many alternative methods of working as possible, in the event of failure of any portion of the plant. You will see from the photographs (figs. 1 and 2) that the drive is by belt from the engine to a countershaft on the gable end of the building, and thence back by belt to the dynamo.

If we call engines and dynamos No. 1 and No. 2, by an arrangement of clutches in this countershaft, No. 1 engine may drive its own (No. 1) dynamo or No. 2 dynamo, as required; similarly No. 2 engine may drive its own dynamo or No. 1 dynamo. One 32½-KW. set is sufficient for all the essential services on the works, as it will operate the complete carbonizing plant and the water-gas blower; so that we have a duplicate set for the maintenance of the gas supply. The two sets are also arranged on the switchboard to run in parallel; so that we have power available at any time up to 65-KW. This has enabled us to discontinue the use of several isolated steam-engines fed by long lengths of steam mains, which, however carefully lagged, give rise to considerable heat losses by condensation—*e.g.*, the coal-crushing, elevating, and storing plant previously driven by a high-speed steam-engine, is now driven by motor; but the steam-engine is retained, and the steam is shut-off at the boiler. A circular saw, the mechanical workshop, and the drier on the sulphate plant, previously driven by steam-engines, have been converted to motor drives. The cutting-out of these long lengths of steam mains has materially reduced the fuel consumption on the boilers, as we can now generate all the steam required by one boiler, steadily fired, instead of two previously. It has thus released a considerable quantity of large coke for sale; the extra gas consumption of the gas-engines being scarcely noticeable. To make assurance doubly sure we have also a 24-H.P. steam-driven generating set in the exhauster-house which would be capable of operating the whole of the carbonizing plant and the water-gas plant by arrangement in working.

I mentioned previously that the old stoking machinery was operated by compressed air, and that in connection with this plant we had a two-stage air compressor driven by a steam-engine, tandem fashion. This steam-engine is of substantial design; and in the dismantling of the plant, the air-compressing cylinders were removed, but the steam-engine was retained. The spare armature carried in connection with the gas-engine driven sets has been made into a complete dynamo. The steam-engine has been thoroughly overhauled; and by suitable countershaft drive we have a spare steam generating set, which at times we may find more convenient to run than the gas-engine driven sets. Here again, the importance of the machine shop is emphasized. If we had not had facilities for melting-up, re-casting, and finishing bearings, and generally overhauling, we should not have called in outside assistance; and the steam-engine would have been scrapped with the rest.

The same remarks apply also in the case of gas for lighting on the works. Everyone knows how difficult it is to control gas consumption and waste on the works, specially in the retort-house, on the tops of retort stacks, coal stores, &c. If "flat" flames are used, they generally become "round" flames from the open end of the supply-pipe. No stoker was ever known to respect a flat-flame burner. We have therefore entirely eliminated the use of gas for lighting through gas-supply pipes; the gas being used in a gas-engine for the production of electricity, and the consumption is only about 20 p.ct. of the amount used and wasted previously. The small 8-H.P. lighting set is seen in the centre of the photograph (fig. 2), and provides in the daytime the power required for the machine shop, circular saw, and sulphate drier, and for lighting at night when the large plant is not running. A small belt-driven air-compressor is seen on the left of this small generating set. This we have found of inestimable value for all kinds of

purposes on the works. The convenience of a supply of compressed air on a gas-works is, I think, not sufficiently appreciated. For blowing acid into overhead acid tanks, liquids from low to high levels, emptying syphons by creating vacuum in a central receiving chamber, clearing obstructions, and for many other purposes we have found it useful. It can be conveyed anywhere by flexible hose; whereas to instal a pump for temporary work might be a formidable job.

It will be seen from the photographs that the power house is finished in a neat style, the beds and dado being of white glazed bricks, and the floor of red tiles laid herring-bone fashion and relieved by a border of coloured tiles. The cables from the dynamos to the switchboard are laid in underground troughs, and are covered with chequer steel plates.

The new 60,000 c.ft. per hour station meter calls for no description. It was erected on the site of the old meter by suitably enlarging the house; and the old meter was thoroughly overhauled and re-erected on a new site for the measurement of water gas.

Sulphate of Ammonia Plant.

The general arrangement of the plant is shown in the diagrams. In arranging the plant, the object was to make it a "one man" plant from the liquor well to the bagging of the sulphate; and this has been accomplished. A youth carries out the whole of the operations, including the bagging of the salt.

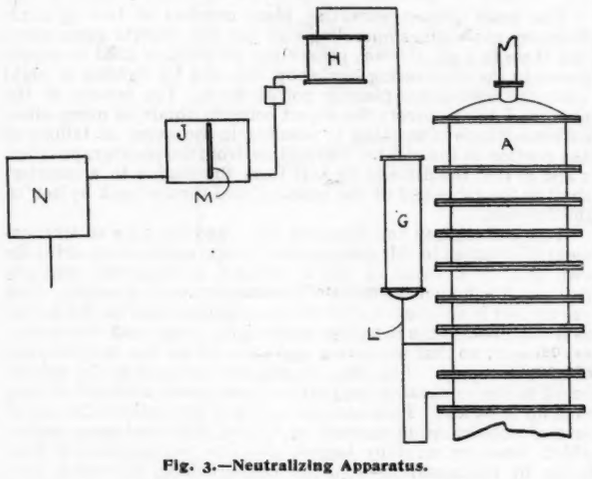


Fig. 3.—Neutralizing Apparatus.

Fig. 3 shows the arrangement of the neutralizing apparatus. A pipe L is taken from the ammonia still A just above the liming section, where the steam is free from H_2S. A reflux condenser G is fitted so that a portion of the steam is condensed out and flows back through the seal shown into the still. The ammonia vapours, along with a certain amount of steam, collect in the condenser H in the form of about 3 p.ct. ammonia solution; and this solution flows into the galvanized tank J. This tank is provided with a gauge glass M; and the solution flows into the lead-lined tank N as required, where it is diluted with water until it contains about 1 p.ct. free ammonia. This solution is run into the centrifugal basket with each charge of sulphate, and it takes about 1 gallon of the weak liquor for each cwt. of sulphate made to perform the neutralizing operation.

It is most important that the whizzing of the sulphate, before the introduction of the ammonia solution, be very complete, so as to get rid of the mother liquor which contains a large percentage of free acid. After whizzing, the sulphate of ammonia contains about 2 p.ct. of moisture. It is then passed through the bottom of the centrifugal machine basket and drops into the final drier in a batch. The drier is rotated by a small electric motor; the sulphate being carried round by lifting shovels and brought into contact with the steam heating-jacket. The drier is so arranged that the sulphate finds its way to the opposite end of the machine; and when properly dried is discharged automatically through the perforated plate in the side of the machine into bags. The sulphate usually contains under 0·04 p.ct. of free acid, 25·6 p.ct. NH_3, and less than 0·1 p.ct. of moisture.

Household Ammonia.

Fig. 4 shows the apparatus used for the manufacture of a 12 p.ct. solution of ammonia, which is sold by the Company for household purposes. The still consists of two parts. A is a cast-iron cylindrical shell 5 ft. in height by 3 ft. in diameter. The interior is fitted with a perforated steam pipe entering at the base of the still; and in the upper portion of the still there is a dry-steam coil D. A cast-iron funnel fitted at the top admits the sulphate of ammonia and lime for the generation of the ammonia gas. On the top of this shell, three trays B of the usual pattern are fitted. The 2 in. outlet pipe from B passes vertically up through a 4 in. cast-iron pipe E, and thence spirally through a reflux condenser F. The condensing ammonia gases and steam pass from the top of the reflux condenser into the storage tank; the pipe being sealed underneath the liquid contained therein. In starting-up the plant, ammonia gases are first evolved; and it is necessary to have a supply of water in the storage tank, which

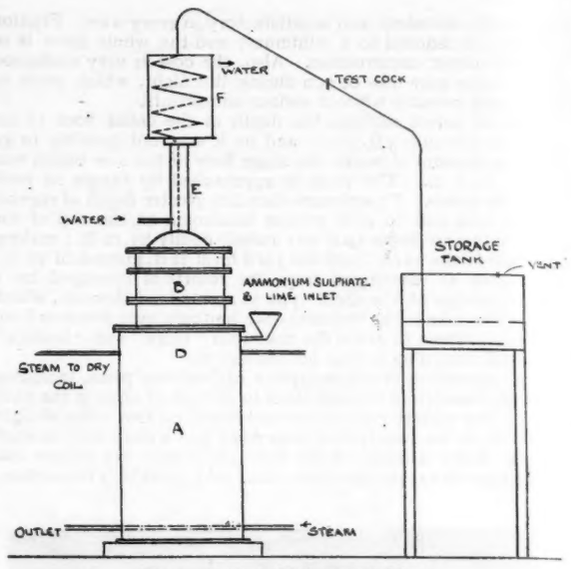


Fig. 4.—Household Ammonia Plant.

ultimately becomes a solution of ammonia gas in water. From the storage tank, the liquid passes through a wood-pulp and muslin filter into bottles for distribution.

The work carried out by the Company's own staff calls for no special mention. The whole of the buildings are of substantial design, built with good red facing bricks, and have slated roofs. The mechanical engineering workshop is equipped with two lathes (one for very large work), a drilling machine, a power screwing machine (up to 6 in. wrought-iron pipe), a shaping machine, hack saw, emery grinders, &c.; the whole being driven by a 6-H P. motor. The exhauster-house floor, which was previously below the yard level and liable to flooding, has been raised 18 in., and the whole of the machinery therein. The machinery beds and the interior generally have been finished-off on the same lines as the power house.

Tar Distillation and Benzole Plants.

The Company have for very many years had their own complete tar distillation plant on a site about 1½ miles away from the gas-works. This was found to be a costly and inconvenient arrangement; the whole of the tar having to be carted through the town from the gas-works, and the products of distillation carted back to the railway station or the riverside quay. We have now removed the plant to the gas-works site, and taken the opportunity to rebuild it on modern lines. The plant is adapted for the continuous production of dehydrated tar, and intermittent complete distillation to pitch. For continuous dehydration, the heating will be done by steam only; but for complete distillation, the latter stages of the distillation will be done by direct fire; the stills being set over a furnace in the usual way. The plant is arranged to conserve as much as possible of the heat used in the process. Saturated steam at 80 lbs. pressure will be superheated to about 150° Fahr. superheat, which will give an ample temperature for dehydration and carry well on to the final distillation to pitch.

To explain the working of the plant, I have prepared two diagrams (figs. 5 and 6), one showing the arrangement as worked for continuous dehydration, and the other for intermittent complete distillation. It will be understood that both these arrangements, by suitable pipes, cocks, &c., are embodied in the plant as erected.

The plant consists of two pot stills, each having a working capacity of about 10 tons of crude tar. These are fed by gravity from the overhead settling tank, either through a heat exchanger when dehydrating, or from a pre-heater set at such a height that the stills are filled by gravity from it when completely distilling. This preheater takes a complete charge for one still. When dehydrating only, the preheater of the complete distillation plant is used as a water condenser, and the water condenser proper is used for finally cooling the dehydrated tar so that it may be run direct into barrels. The crude tar flows by gravity through the heat exchanger, where it is heated up by the outflowing dehydrated tar from the stills, and enters the still on the surface of the hot tar therein. The heat is supplied by superheated steam in the gilled coil as shown in the section of the still in the diagram. The vapours (oil and water) from the process are condensed in the circular preheater, which has a separate coil for each still, whence the liquids flow to the receivers and separators and to their respective storage tanks.

When carrying out a complete distillation, crude tar in the preheater acts as a preliminary condenser of the vapours, which afterwards pass to the main water condenser. In this way the tar undergoes a preliminary dehydration, and is heated up to a considerable extent before it enters the main stills. The vapours from this preliminary condensation are led into the main vapour

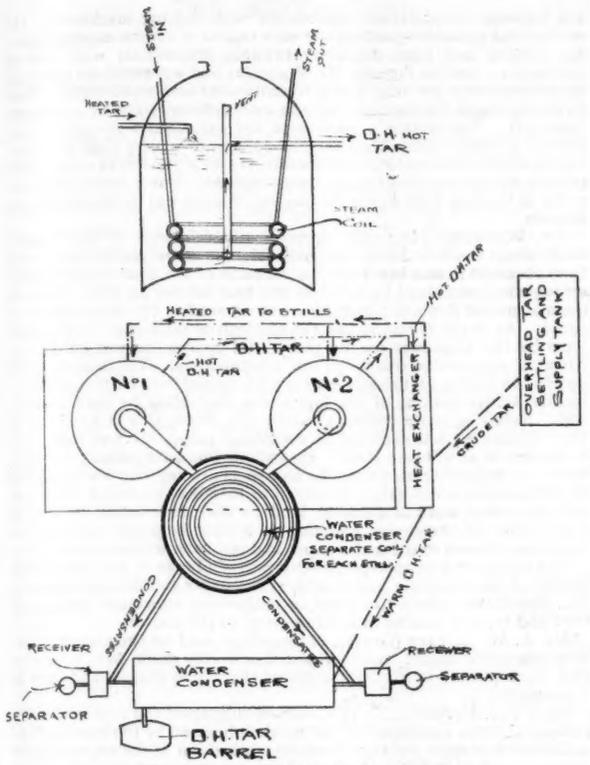


Fig. 5.—Continuous Dehydration Plant.

pipe and on to the water condenser. At the end of a distillation, the pitch is run out to the pitch cooler, and the previously heated tar takes its place in the still; a fresh supply of cold tar being then run in and heated ready for the other still when this is finished. We are arranging to distil the light oils produced in the process of distillation for benzole, which will be rectified and used as a motor fuel for our coke lorries. This is not yet an accomplished fact.

In order to be able to take full advantage of the remunerative prices obtained for dehydrated tar during the road-tarring season, we have raised the sides and roofed-over in concrete a storage tank previously used for the storage of roof water. This with our existing tar storage will enable us to store more than twelve months production of tar; and the capacity of our stills is such that, if necessary, the whole of this could be dehydrated in about six weeks time. Members will realize the advantage of having at disposal a full year's production of tar during the short tarring season.

Having now described the chief points in our scheme of reconstruction, and our reasons for the adoption of the particular types of plant, I cannot see that any useful purpose would be served by elaborating details of construction. I therefore propose to give a few figures obtained in actual working. No comparisons will be given with other systems of carbonization, as I have not first hand experience. Further, the results are not "tests," but actual figures extracted from our books. Members requiring comparative data respecting the various systems of carbonization cannot do better than refer to the excellent paper by Mr. Thomas Carmichael, read before the Southern Association of Gas Engineers in November last.

So far I have confined my remarks on reconstruction to the works proper; but this account would not be complete without a reference to what has been done in the reconstruction of our showrooms and offices. Previously, our offices, showrooms, and distribution staff were housed in separate buildings; this being a source of weakness in our administration and organization. The duties of the two staffs are so interwoven that great inconvenience was experienced not only by the staffs themselves, but by our

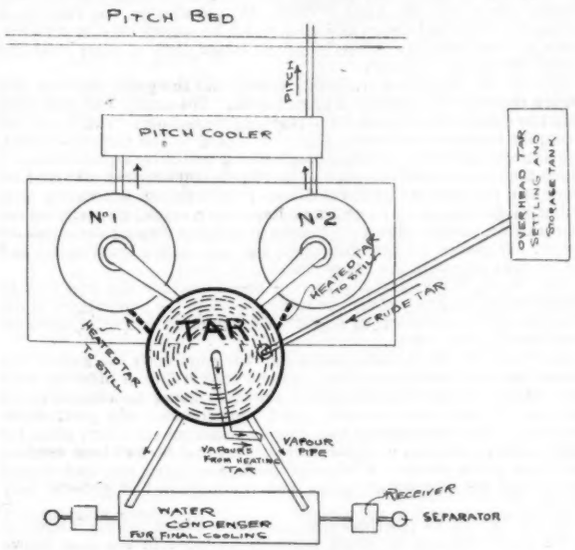


Fig. 6.—Complete Distillation Plant.

consumers and the public generally; and much valuable time was lost in communication between the two sets of premises. We have now transferred our offices to the showrooms and distribution department building; and the old offices have been converted into a social club for the employees and their wives.

The time has gone by, and rightly so, when men were content to be looked upon as so many "hands." Our relations with our employees in the old days before the war were always of the best; and it was most unfortunate that the organization on a national basis of the relations between employers and employed more or less wiped out the individual relation between the Company and its employees. I am pleased to say we have got back to that desirable state; and we now manage our own affairs without interference from outside sources. We have a loyal and contented staff; and we should be lacking in our duty if we did not show our appreciation by providing them with some interest outside the daily routine of working hours.

The Company have given the free use of the premises, redecorated them throughout, and provide free heating and lighting. They have also advanced on loan a sum of money for the equipment of the club, which is provided with billiard and bagatelle tables and other games. A separate section has been set apart for a sewing and social room for the wives of the employees. Lectures will be provided for the younger members of the staff on certain evenings during the winter.

Discussion.

The PRESIDENT (Mr. T. F. Canning) thought they must all congratulate Mr. Walmsley upon his excellent paper. The work he had undertaken at Great Yarmouth had been colossal. He had reorganized the undertaking, and practically reconstructed it, from the retort-house to

Comparisons of Working Results for the Years Ended Dec. 31, 1919, 1920, 1922, and for the First Three Months of 1923 (from Jan. 1 to March 31, 1923).

NOTE.—1919 and 1920 are the last two complete years before reconstruction, and 1922 the first complete year after reconstruction.

	Year ending Dec. 31, 1919.	Year ending Dec. 31, 1920.	Year ending Dec. 31, 1922.	Quarter ending March 31, 1923.
Coal carbonized . . . . . tons	16,019	16,420	12,673	3,328
Coal gas produced . . . . . c.ft.	172,800,000	170,134,000	156,768,000	41,162,000
Coal gas produced per ton of coal . . . . . c.ft.	10,787	10,361	12,370	12,368
Blue water gas produced	*Nil*	*Nil*	19,592,000	1,894,000
P.ct. in mixture	*Nil*	*Nil*	11·1	4·39
Calorific value mixed gas	..	..	480 B.Th.U.§	480 B.Th.U.§
Carbonizing wages	£6152*	£8,928†	£1,564	£322
Carbonizing wages per ton	7s. 8·17d.	10s. 10·4d.	2s. 5·6d.	1s. 11·2d.
Carbonizing wages per 1000	8·54d.	1s. 0·5d.	2·39d.	1·87d.
Coke produced (13·5 cwts. per ton)	10,813 tons	11,083 tons	8,553 tons	2,247 tons
Coke sold and used for water gas	5,866 tons	5,196 tons	5,148 tons	1,590 tons
Do. per ton of coal carbonized	7·32 cwts.	6·33 cwts.	8·13 cwts.	9·55 cwts.
Tar produced . . . . . gallons	130,406	129,320	107,336	29,952
Tar produced per ton of coal	8·1 gallons	7·8 gallons	8·4 gallons	9·0 gallons
Sulphate of ammonia produced	85⅛ tons	6 tons	55⅛ tons	29⅛ tons
Sulphate of ammonia per ton of coal	11·9 lbs.	303,104 gallons ‡	28,326 gallons ‡	20 lbs.

* Eight-hour shifts introduced May, 1919. Only two-thirds coal handled in 8 hours as in 12 hours previously.
† Full year's working on 8-hour shifts.
‡ Sulphate plant (old) shut down. Restarted at the latter end of 1922—liquor run to waste.
§ Company's standard—actually supplied nearer 490 B.Th.U.

the distribution department. The author was also to be congratulated upon the working results detailed in the paper. They were a wonderful record; and the Chairman and Directors of the Company must be very pleased indeed to think that they possessed the services of so able an Engineer. The paper would be extremely useful to those who might have similar work to carry out, for it contained an enormous amount of information. As Mr. Gill was present, they would like him to take part in the discussion.

Mr. G. M. Gill (London) said he had not come prepared in any way to discuss the paper. It was of a kind that must be found useful when similar work was on hand. While Mr. Walmsley was reading it through, he did not notice anything which he would care to criticize, though there were one or two points on which some of them would no doubt like to ask questions.

Mr. W. B. Farquhar (London) agreed that the paper was not one which could be criticized to a great extent. The author had gone fully into the details of the work he had so well carried out. There was just one question he would like to ask with regard to the electrical plant. He noticed that there were gas-engines and belt-driven generators. A short time ago he had occasion to put down an electrical set; and he went into the question of direct driven *v.* belt driven generating sets, either by gas-engine or by steam-engine. As a result, he preferred the direct drive, and put down a Crossley gas-engine driving the dynamos direct. It needed a larger generator, but one ran at a lower speed, and he thought gained in the life of the electric plant.

Mr. W. H. Mainwaring (Lincoln) asked whether the one man in charge of the sulphate plant was able to regulate the percentages of the two strengths mentioned, or was it necessary to have special chemical assistance at this point.

Mr. F. A. West (Newark) remarked that apparently the author was rather short of scrubbing plant; and he took it that at times he must have had a considerable amount of ammonia going forward on to his district. If this was the case, had he experienced any great meter troubles? He (the speaker) had been very short of scrubbing plant for some years; and this, coupled with the fact that he had been sending out a low-grade gas and a large percentage of water gas, had played havoc with his distribution plant, and the leakage had gone up very much.

Mr. E. W. Smith (Chelmsford) said he had been greatly interested in the paper, because he would probably be faced in the near future with alterations and extensions which would be somewhat similar to those Mr. Walmsley had been carrying out at Yarmouth. One point which had been rather disturbing him was with regard to the comparison between verticals and horizontals with stoking machinery. On economical grounds—particularly with regard to capital expenditure—his leaning had been decidedly towards horizontals with stoking machinery; and he thought Mr. Walmsley had answered the question as to which was the most useful for comparatively small works. The figure of wages for carbonizing was extraordinarily low at 1·87d. per 1000 c.ft. The author's preference for gas-engines for generating electric current rather bore out the opinion of a very able electrical engineer, that one could produce electricity on a gas-works much more cheaply by gas engines than by steam-engines. But it would be of interest to know at what figure the gas was charged out at for driving the engines.

Mr. Walmsley, in reply, agreed, with reference to the remark made about the belt drive, that probably the same result could have been obtained in another way; but he came to the conclusion that the arrangement explained by him was the best for his purpose. It gave them a smaller dynamo; and there was no need to run at an excessive speed. As to the regulation of the strength of the liquor, this was all done by the attendant on the plant. Of course, he was subject to chemical supervision daily, but not continuously. The attendant did not do the testing of the salt, which was carried out by the chemist; but the actual working of the liquor was controlled by the man himself. Referring to the point raised by Mr. West, it was not that he (Mr. Walmsley) was deficient in scrubbing plant. It was there, but it was not in an efficient state He had no ammonia passing the purifiers. In preparing his paper, he had specially kept in view the giving of information which might be useful to members having in mind the carrying out of work of a similar kind to that undertaken by him at Yarmouth. If there was anything in it that helped in this way, he would be pleased to think the paper had not been written in vain.

The President, proposing a hearty vote of thanks to Mr. Walmsley, remarked that one only had to look at the paper and the photographs, &c., distributed round the room to realize the enormous amount of time and trouble that he must have given to the matter.

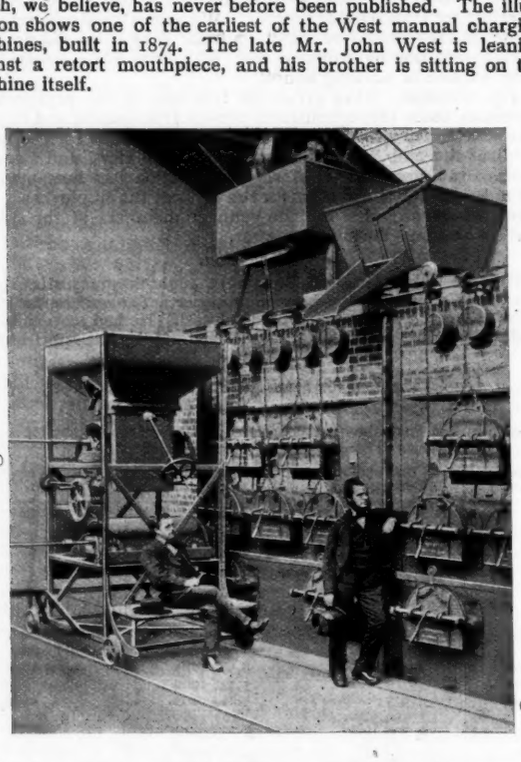
Mr. A. W. Sumner (Grays), in seconding, said he knew what reconstructing works meant, and so realized how very much Mr. Walmsley had accomplished in the comparatively short time that he had been at Yarmouth.

Mr. F. M. Paternoster (Felixstowe) supported the vote, and made reference to the excellence of the results obtained by the author. The make per man from horizontal retorts worked out at the highest figure he (the speaker) had heard of; and he congratulated Mr. Walmsley upon it.

WEST'S MANUAL CHARGING MACHINE.

An Interesting Photograph.

By the courtesy of the Editor of "West's Gas," a little monthly journal published by West's Social Society, whose members are the employees of West's Gas Improvement Company, Ltd., we are enabled to reproduce a photograph of some historical interest, which, we believe, has never before been published. The illustration shows one of the earliest of the West manual charging machines, built in 1874. The late Mr. John West is leaning against a retort mouthpiece, and his brother is sitting on the machine itself.



We learn that our little contemporary has already proved of considerable interest and amusement to the employees of the firm and their friends. In this particular number, Mr. Fred. West commences a series of articles in which he will trace the history of the firm in a chatty style, which is sure to be of interest to members of West's Social Society, and, no doubt, to all other readers of the paper.

Of course, most of the paper is occupied by news, articles, and jokes which are only intelligible to those "in the know." One item, however, will be of interest to the outside world, and that is the announcement that a "John West Bed" in the Ancoats Hospital, Manchester, has been endowed by joint subscription of the Directors and employees of the firm, as a memorial to the late "Guv'nor."

SCOTTISH JUNIOR GAS ASSOCIATION
(EASTERN DISTRICT).

Annual General Meeting.

The Annual General Meeting of the Association was held in Edinburgh, on Saturday, April 21, when a large number of members were present.

Mr. G. H. Gemmell, F.I.C., Official Analyst to the North British Association of Gas Managers, gave an address dealing with the chemist in the gas industry, which appeared in last week's "Journal," p. 220.

Mr. D. D. Bruce (East Wemyss), Vice-President, who presided in the absence of Mr. W. A. Dearden, asked the members to accord to Mr. Gemmell a very hearty vote of thanks for his interesting and valuable address. He said it was one worthy of much consideration. The advice to juniors would certainly prove of great worth in the future, if thoroughly digested.

A short discussion followed in which Mr. Smart (Dunfermline) and Mr. Cummings (Bathgate) took part.

The usual business of the Association was then proceeded with, and the following office-bearers were elected.

President.—Mr. D. D. Bruce, East Wemyss.

Vice President.—Mr. R. L. Laing, Brechin.

Hon. Secretary and Treasurer.—Mr. E. L. Farquhar, Gas-Works, Granton.

Members of Council.—Messrs. Alan Clark, Perth; H. A. Yuill, Dundee; P. F. Smart, Dunfermline; and Thos. Mackie, Kelty.

Auditors.—Messrs. John Moyes and Sam. M'Spence, Edinburgh.

The Hon. Secretary (Mr. R. L. Laing, Brechin) reported that there were still 100 members on the roll; 10 new ones having been added during the session. The balance-sheet showed a credit balance of £16, which was considered satisfactory.

The Council, in their report, considered that the past session had been a very successful one; and the meeting was unanimous in the opinion that the various social functions during the session should be continued.

A number of members and their lady friends had arranged a social evening, during which there was a whist drive. A short dance concluded the programme.

THE METER CARD.

By NORTON H. HUMPHRYS.

THE recommendations of the Committee recently appointed by Parliament for the purpose of inquiring into and reporting on the therm and its suitability as a unit of charge, if adopted by the Board of Trade, will add yet another item to the already heavy responsibilities inflicted on gas undertakings, in accordance with the now established practice of handicapping industry by the establishment of supervising Government departments. Some of the regulations are of the grandmotherly kind, in that they are incapable of meeting the object desired; others are too costly. The expenses incidental to carrying out the provisions of the Gas Regulation Act of 1920, may be a trifle as applied to large-scale operations, but may be a serious matter to small ones. Where the obligation consists of a fixed expense, the weight of the load varies inversely with the size of the business. An example is furnished by the annual fee payable under the Alkali Works, &c., Act., now increased to £6, which may vary from a fraction of a penny per ton of sulphate manufactured, in the largest, to 10s. or more in the smallest gas-works. These additions to incidental, or more properly legal, charges have already reached a considerable amount, and therefore further additions should not be allowed to pass without protest or proof of necessity. Strange to say, these inflictions are rarely opposed by the party who eventually have to bear the greater part of the burden—the consumer. He not only regards them with indifference as matters that do not concern his pocket, but his representatives invariably assume that his advantage is served by increasing them.

The Committee, while generally supporting the 1920 Act, under which the Gas Referees can make such arrangements as they think necessary for the instructions of consumers respecting the new system of charge, appear to hold the opinion that something more is required, and therefore recommend that every consumer shall be furnished with a meter card showing clearly, in addition to the date and the meter indices, the current declared calorific value, the number of cubic feet registered (since the last reading?) and the number of therms consumed calculated at the declared calorific value. This means doubling the work to be done by the meter inspector at each house, which is the same thing as doubling the staff of men required in this department. This is a sufficiently important addition to expenses to warrant careful consideration of the advantages that will thereby be secured. One would like to have expression of opinion, not from prominent business men, but from those who come into daily contact with large numbers of consumers. Is there evidence of a general demand for a supplement to the usual quarterly bill? And to what extent (if any) would it be capable of benefiting or placating consumers, popularizing gas, or facilitating business?

The meter card is not a new and untried scheme, nor in any sense a new departure. It is a resuscitation of a procedure that at one time, now beyond the recollection of many readers, was commonly used, but latterly has almost dropped out of sight as not proving of much use in practice. The evidence submitted to the Committee, as published, does not indicate alteration in the position, or probability that the meter card may be expected to prove more successful in the future than in the past. The complaints submitted by consumers were extremely scanty regarded as selections from a total comprising many millions, and in no sense of a representative character. Not one of them would have been assisted by a meter card, and very slight reference was made to readings of the meter either by the company or the consumer. Many shareholders in gas undertakings have no interest, beyond the amount available for dividend, in the elaborate statements of accounts which are periodically inserted in their letter boxes. Similarly, over ninety per cent. of the consumers are indifferent to the cubic foot, the therm, or any detail other than the total. If the figure strikes them as reasonable, they pay; if it appears high, as tested by the standard of personal opinion and perhaps with the assistance of personal gossip or newspaper "intelligence," they protest with greater or less vigour according to temperament or condition of mind at the moment, or in some cases go to the extent of complaining at the office or writing to the papers. Their objective is not so much an explanation or further statement of detail, as a reduction in the amount of cash payable.

The Board of Trade electricity unit is admittedly a much more complicated affair than the therm; yet rarely does a dispute or complaint about the cost of electricity find its way into the newspapers or the Law Courts. One would like to know whether the electricity companies have adopted meter cards; and if not, the reasons why such appendage is more necessary for the gas meter, which is a positive measure of the quantity of gas passed through it, than for the electricity meter, which involves an inferential measure.

The meter card, as generally understood, is nothing more or less than an advance copy of details to be included in the formal account. All it can do is to inform the customer, on the date of the inspector's visit, in respect to certain figures that will be presented about a fortnight later. The only possible source of dispute on which it has any bearing, is the accuracy of the meter reading and clerical work—a point that has not been questioned. The theory is that it affords opportunity for checking the correctness or otherwise of the reading, and is standing evidence that the index has been officially "taken." But how many consumers care to avail themselves of these privileges, or to be in a position to substantiate the date of reading as set forth on the account? In the course of half-a-century's continual contact with consumers, the number who systematically check the meter readings can be easily counted on the fingers, leaving out of consideration the exceptions to be presently noticed.

The wasteful or negligent user stands greatest in need of advance information; and a fortnight's pre-dating is better than nothing. But unfortunately he is least likely to use it. The intelligent and thrifty consumer, who wisely believes in getting twenty shillings value out of every pound expended, does not want the card, having anticipated it by his own weekly or monthly readings. He knows that economy in the use of gas is not to be effected by a card trick, but by attention to the taps. That at best it is not an efficient substitute for short-period readings of the meter, is proved by the common practice with railway companies and other large users, of ascertaining the consumption of gas daily or weekly, as they do with regard to all other material used. Gas companies welcome such procedure as invariably ensuring a satisfactory understanding as to the quantity of gas consumed and charged for.

One alternative to the meter card is the extension of the latter practice to the rank and file. Another is the adoption of monthly or bi-quarterly accounting periods in preference to the quarter already partly adopted in some districts. A very general impression exists to the effect that the quarterly period is too long. The incidental advantages secured by an additional mid-quarterly meter reading are well known; and it could be effected at about the same cost as the meter card. In the few cases where the quantity of gas registered appeared abnormal, the consumer should be informed; but otherwise there is no need for giving him a copy of the figures.

The established attitude of gas undertakings in regard to information tendered to their customers was not presented in correct perspective at the inquiry, judging from the official report. A reader might be excused for concluding that the industry, as a whole, had followed a policy of concealment, and that the complaints that led up to the inquiry were a natural consequence of such a mistake. There was a period when the visitor to the gas-works would find the gates locked, and an applicant for information at the office was met in a similar attitude. But that has passed out of the memory of the oldest inhabitant, and to-day there are few industries more open and communicative to their customers on details commonly considered private property. In the first place, there are legal obligations enabling any member of the public to get an intimate insight into the amount of profit earned, and its disposal. But apart from these, the general policy is that followed by those who have nothing to conceal. The usual feature in every town of any importance is a showroom in which is included a complaint counter, where the fullest possible attention is given to every *bona fide* inquirer.

One might reasonably expect to find, in the published report, at least some mention of the fact that the Gas Referees have already put into force prescriptions ensuring that every customer shall be furnished with an explanatory leaflet, and that the collectors shall reply freely to inquiries. And one might also conclude that the juxtaposition of therms and cubic feet on the account rendered was carefully avoided, and that few were without fault; whereas the fact is that many, perhaps the majority, have not taken the cubic foot term off the bill. Those who have done so were actuated by considerations as to needless repetition, rather than a desire to suppress information. They thought that people who did not read the leaflet would be equally indifferent to explanatory matter on the bill. Frequently the established form of account is retained, and the only alterations are the substitution of the therm for the 1000 c.ft. rate, and the addition of a column showing the therm equivalent.

With such ample opportunity for obtaining information, there is no excuse whatever for pleading ignorance. If ninety per cent. or more of the recipients do not trouble to master the explanations issued in compliance with the prescriptions of the Gas Referees, they are not likely to attach more importance to particulars appended to the bill. The gas undertakings should not be blamed or held responsible for consequent ignorance.

With all respect for the sound, businesslike tone of the recommendations, I venture to submit that the prescriptions issued by the Gas Referees, together with other existing machinery, fully provide for all reasonable requirements as to information on methods of charge, and that the meter card is a useless superfluity, necessitating additional expense and serving no useful purpose. There is so little evidence of a demand for it among the consumers that, if adopted, it should be limited to "by request;" and for that matter, there are few who would not be willing to furnish a card, in response to genuine application.

Gas and Waste Heat for Steam-Raising Purposes.—Owing to the amount of matter to be overtaken this week, we are compelled to hold over the interesting lecture which Major W. Gregson (late R.E.), B.Sc. (Eng.), delivered before the London and Southern District Junior Gas Association last Friday evening, on "Recent Developments in Connection with Gas-Fired Steam-Boilers and the Utilization of Waste Heat for Steam-Raising Purposes."

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

The Junior Association of the South Wales district concluded their first session on Saturday, April 21, with a full day, which comprised a visit to the works of the British Mannesmann Tube Company, Ltd., at Newport, the annual general meeting, and a paper by Mr. E. H. Clarry on "A Pressure Proposition."

VISIT TO THE WORKS OF THE MANNESMANN TUBE COMPANY.

By the kind invitation of the Directors of the British Mannesmann Tube Company, Ltd., the party, which numbered over fifty, were privileged in inspecting the plant in the morning, when the various operations in making the tubes were seen under ordinary working conditions. Under the leadership of guides, the different sections of the plant were visited in turn. The size of the undertaking is a striking feature; the site, shops, and machinery being in accord with the heavy work turned out. The ease with which billets and tubes of great weight are handled is a credit to the engineering skill of the designers of the transport arrangements. Magnetic cranes are used to raise and convey billets; and overhead grab-cranes handle the tubes in the shops.

Hydraulic, steam, and electricity are used for power on the works, besides which there is a large gas-producer plant. In the hydraulic power house, there are two 600 KW. sets driven by "Sentinel" vertical gas-engines (direct coupled). These provide energy for driving the hydraulic pumps compressed to 1500 lbs. per sq. in. As this plant is insufficient, additional hydraulic power is being arranged for; and a triple-expansion steam-engine is in course of erection, and will drive two compressors. Electricity is generated by two Belliss and Morcom triple-expansion engines complete with vacuum pumps, &c., direct coupled to generators for alternating current at 3000 volts which is transformed in the same building. Steam for engines is obtained by means of six Babcock and Wilcox boilers with automatic coal feed. The various processes involved in making weldless steel tubes were described by Mr. E. H. Clarry in his paper in the afternoon.

After lunch, the members assembled for the annual general meeting at the Gas Offices, Mill Street, Newport.

Mr. J. H. Canning, O.B.E., F.C.S., Engineer and Manager of the Newport (Mon.) Gas Company, welcomed the members. In the course of his remarks, he said that he was enchanted by the attendance. He had previously been impressed by the enthusiastic proceedings of the Association, and he congratulated the President and officers on the useful work which was being done, and which was influencing the industry in South Wales. He assured them that his Directors and he himself felt that anything they could do to assist in the furtherance of the aims of the Association would be efforts well directed. At any time they desired facilities for their meetings, he would be pleased to place the accommodation at Newport at their disposal.

The Business Meeting.

After the minutes of the previous meeting had been read,

The President called upon Mr. T. Noall to read the Treasurer's report.

Mr. Noall apologized for the absence of the Treasurer, Mr. R. J. Auckland, of Cardiff, who regretted his inability to attend. It was stated that the Association was in a flourishing financial condition, with a balance in hand of £16 5s., besides which there were several subscriptions from members which would no doubt be forthcoming.

Mr. C. Twist (Swansea) moved, and Mr. E. R. B. French (Swansea) seconded, the adoption of the report, which was carried.

The Hon. Secretary (Mr. B. J. Bell) read his report, which was adopted.

The report stated that at the present time there were 116 ordinary members, which was an indication of the popularity of the Association as a technical and educational institution. The Association was to be congratulated on the excellence of the papers submitted by members, as these had been valuable contributions. Visits had been made during the session to the works of the Cardiff Incandescent Mantle Company; the Maritime Coke-Ovens, Pontypridd; the works of the Mannesmann Tube Company, Ltd., at Newport; and the Swansea Gas-Works. The Joint Council of the British Junior Gas Associations had cordially accepted the application for affiliation; and the Association would be represented.

Much of the success of the first year had been due to the influence and assistance extended by the President, Council, and members of the Wales and Monmouthshire Institution of Gas Engineers and Managers; and they acknowledged their indebtedness to the senior body, and also to the Directors, General Manager and Secretary (Mr. George Clarry), and Engineer (Mr. H. D. Madden) of the Cardiff Gas Light and Coke Company, the Directors and Engineer and Manager (Mr. W. H. Johns) of the Swansea Gas Light Company, and the Directors and Engineer and Manager (Mr. J. H. Canning) of the Newport Gas Company, for providing accommodation and hospitality from time to time. With the continuance of such interest in the Association's efforts, and the enthusiasm of members, the Council had every confidence in the future.

Election of Officers.

The election of officers was as follows: Mr. T. A. Canning, President; Mr. V. H. Dodgson, Vice-President (Senior), and Mr. B. J. Bell, Vice-President (Junior). For the two vacancies on the Council, Mr. J. B. James (Cardiff) and Mr. C. B. Felton (Newport) were elected. The Hon. Auditors for the coming session are Mr. T. Noall and Mr. R. W. Foster, both of Cardiff.

Mr. T. Noall moved a vote of thanks to the officers, which was carried unanimously.

Mr. E. H. Clarry then read a paper entitled

A PRESSURE PROPOSITION.

Cardiff and Outlying Districts.

The distribution area of Cardiff covers some 67 square miles, embracing 248 miles of low-pressure and 11 miles of high-pressure mains, and catering for 46,000 consumers. As is only natural with all progressive towns, the population drifts to the outskirts, all of which have to be supplied with gas, either from sorely tried existing mains or by some new scheme.

To those to whom distribution is an unknown quantity, it may be likened to a tree—the trunk supplying the bulk, and the branches the individual feeders. Though, as a body, gas engineers are world-renowned for their foresight, it would take a superman to lay mains of trunk size to cope with the requirements fifty or sixty years hence. It will thus be seen that if the outlying districts are developed to any extent, the original trunk mains will require augmentation; and it was a problem of this nature which in Cardiff's case called for attention.

The rapid growth of the Northern area of Whitchurch, Llanishen, and Rhubina, coupled with the large Mynachty estate, placed such a strain on the distributing system that adequate pressure at the distant points was maintained only with difficulty. Building developments were still going on in these outlying areas; and this presented a proposition which required serious attention.

Re-organization of the Mains Department.

In the past, the mains gang had been controlled by a foreman, who kept their time in a book; and it was the duty of one of the clerks in the office to check and order their stores. This arrangement was all right when the mains department was not exceptionally busy. A year or so ago, however, things altered. The department was faced with a general post-war building activity in the area of supply, which included four new housing schemes. This has meant that in the past two years some 18 miles of mains have been laid. In addition, to make up the leeway of the war years, a large amount of work was involved in the renewal of mains. Added to this, the mains department was called upon to take over the service work of the Company. This consisted of five service gangs of an average strength of ten men, their stores, time, and wages, costs, estimates, &c. Here, again, the renewal of services, which became an urgent necessity owing to conditions already mentioned, involved special consideration in order to cope with the work.

Details of Mains and Service System.

Orders for the laying of new services, or the renewal of old ones, are received by the mains and services department; the former from the head or branch office, who took the signature to the contract for the new supply, the latter from the control office responsible for the working of the gasfitters' department. Immediately these orders are received by the mains and services department, a job docket is made out for the work.

This job docket commences with an instruction to lay, repair, or renew the service (as the case may be); and the address is filled in. It includes space for the numbering of the job, and also for the date on which the original application was made, and the date it was received by the mains and services department. It is divided into two portions by a perforation—one half being the costing portion, on which will ultimately appear the total cost of the job, and which I will refer to as the servicelayer's half; the other being for reinstatement particulars, which I will refer to as the reinstatement half. In the following remarks, when I refer to any entries by servicelayer I mean, of course, the servicelayer in charge of the gang. Each gang is comprised of a servicelayer, and generally seven or eight labourers.

The servicelayer's half has space for the inclusion of the number of hours worked and his rate of pay. In the same way provision is left for recording the length of pipe used, and other material.

Then follows a line for the cost of reinstatement, and the actual cost of the job. On the back, provision is left for recording what reinstatement of paving and roadway may be necessary. The servicelayer also adds the length of service chargeable to the consumer. This is decided by the boundary of the property. The consumer pays all inside his boundary, and anything over 30 ft. outside; the remainder being the Company's charge.

The servicelayer also adds the depth of metalling, and the depth of main; these two items being for criticizing the time taken on the job.

The above may seem a good deal of work for the servicelayer, but really it is very little, because all the items are printed for him, and he has only to insert the quantity or length in each case. I have explained the job docket at some length, because it is the fundamental of the whole system.

The foreman collects the job dockets each morning. He divides these among the various gangs. He also returns to the office the dockets for the completed jobs.

The material used on the service is checked to see what running

stock of material is held by each servicelayer, and to arrange for new material to be sent out. The clerk then enters up instructions for reinstatement. The reinstatement half also is provided with space for the man in charge of the reinstatement gang to include the time worked and material used.

COSTING.

The clerk then proceeds to cost. He prices out the labour and material on the servicelayer's half, similarly on the reinstatement leaf, and transfers the total of the latter to the item "cost of reinstatement" on the servicelayer's sheet. He is thus able to arrive at a total cost of the job, which he divides into a cost per foot run of service. On the back of the servicelayer's half he finds the length chargeable to the consumer.

He then works out the length of service at the cost per foot run, to which he adds a percentage for establishment charges, and thus arrives at the amount chargeable to the consumer.

The balance of the total cost he fills in as the amount chargeable to the Company; the total of these two balancing to his total cost of the job.

RECORD KEEPING.

Previously no records were kept; but now, on receiving a complaint from a consumer as to poor supply, we can refer to his service record, and form some idea as to the cause. Each morning, the job dockets are examined, and a list of new services laid is prepared for submission to the fitting department for arrangements for meter fixing, &c., to be done. The jobs are then entered into a "street openings book." This gives the nature of the work, the street, the name of the servicelayer, particulars of reinstatement, when reinstated, and by whom; and provision is left for the date of three visits of inspection of the opening. The latter is very necessary. Corporations and councils are particular that street openings should be perfectly reinstated. Trenches, for instance, often sink after they have received attention, and require further material. We are responsible to councils and local authorities for the maintenance of the surface of any opening we make in the roadway. It is therefore necessary for a systematic arrangement of examination and record to avoid trouble.

TIME-KEEPING.

The men's time is then extracted from the various job dockets, and is entered up on a servicelayer's weekly time-sheet. The cost of each job, as shown on the completed job docket, is now entered in the "summary of services cost book." It was the endeavour to make the mains system of dockets similar to the servicelayer's, so that each gang could handle each others' work without further instructions. The mainlayer keeps a supply of dockets, using one each day, because his jobs, unlike those of the servicelayer, sometimes take a week or more to complete. In this case the clerk summarizes all the dockets for each section of work.

The time of the men is recorded similarly to that of the servicelayer, and is checked weekly with the mainlayer's time book. The material used, as shown on the job docket, is checked with that sent out; and the total cost of each job is entered in the mains cost book. An entry is made in the street openings book similar to that with services. From the entries in the mains cost book and the summary of services cost book, the total labour for a period on mains and services can be checked with the total wages paid; and similarly the total material used can be ascertained for balancing the stores and checking the stock. Furthermore, as each job is a self-balancing one, the total expenditure up to date, on either labour or material, or the total amount of chargeable work, can be seen at a glance daily.

STORES AND MATERIALS.

Prior to this system coming into force, it was the practice for the servicelaying gangs to come into the works each morning and collect their stores, and to receive orders. They also used to return each night. This meant a great loss of time on actual servicelaying—generally two or three hours per day—for each man employed. Under the new system the men report at 7 a.m. on one of the jobs to be done, and their material is taken out to them by a lorry. There is thus no loss on servicelaying time.

OUTLYING DISTRICTS.

It was decided to lay a British Mannesmann steel main of 12 in. diameter from the Grangetown works to a point in Whitchurch, a distance of some 8000 yards, taking-off at one place only—*i.e.*, at Llandaff, to supply round Radyr, back to Nantgarw. A Belliss and Morcom type compressor (vertical), as installed by the Birmingham Corporation Gas Department, capable of delivering 300,000 c.ft. per hour, or 7,200,000 c.ft. per day, was installed at Grangetown; and two Reynolds governors were housed at Whitchurch, and arranged to be worked in parallel.

The inlet to the governor house at Whitchurch was a 12-in. high-pressure steel main, and the outlet a 24-in. cast-iron main. The compressors at Grangetown send gas through this 12-in. main at a pressure as high as 20 lbs. per sq. in. The governors at Whitchurch reduce this into the 24-in. main to about 6 in. water gauge.

DIFFICULTIES ATTENDANT UPON LAYING THE MAIN.

When plotting a proposed pipe-line, it is necessary to study the convenience of all who own, or hold jurisdiction over, any land or property in or over which it is desired to lay the main—county councils, urban district councils, city corporations, lords of the manor, railway companies, canal companies—all must be considered. All of these have to be contended with at Cardiff; and the new main had to cross under two most important railway lines, over a river, and over a canal. Months prior to the actual laying of the main negotiations were conducted with these various authorities—obtaining permission, arranging way-leaves, compensations, &c.

The work was started under the watchful eyes of representatives of the Water Department, Electrical Department, Sewer Department, and Telephone Company—to mention only a few. In the initial stages, every assistance was rendered by the British Mannesmann Tube Company, who spared neither time nor expense in equipping their welders, and doing all in their power.

Perhaps the method of crossing under the Great Western Railway main line may prove of interest. A Sunday was chosen; there being less traffic on this day. Two separate rails had to be crossed; and a start was made at daybreak. Excavation was made to a depth of 6 ft. 6 in. under one set of rails, the bottom of the trench was concreted, and the Mannesmann steel tube, 18-in. in diameter, then embedded as a culvert. This was concreted on top. The trench was then filled in, and the rails were reset. The same operation was repeated on the other side, under the second set of rails. The two 18-in. tubes were married up, and a 12-in. tube then threaded through; the latter being 40 ft. in length. The connections were then made, and a valve was put in at either side; the whole job being completed by four o'clock on the same day.

Another awkward job was encountered in crossing the main road, where there was a double tram-track, with wood blocks set in concrete, and a continual stream of heavy traffic. Trial holes were sunk at either side to ascertain the position and depth of the existing gas, water, and sewerage mains, electric and telephone cables, &c. It was not found possible to thread a pathway through all these—the only way was to tunnel underneath, and permit the traffic to proceed above. This necessitated driving down to some 12 ft. 6 in. in depth—*i.e.*, 8 ft. 6 in. for the pathway of the main, and another 4 ft. to allow for the tube and working space. In addition, as the mains sloped from either direction to this spot, we had to put in a syphon. This meant an excavation of 18 ft. at one place.

Another problem was met with in crossing the River Taff at Llandaff Bridge. Different methods were suggested, such as:

1. Coffer-damming the stream.
2. Suspending the main from the bridge by means of brackets.
3. Boring through the masonry of the buttresses.

Finally, however, by sinking trial holes, we found there was just enough room, by slotting the top brickwork, to sink the main in the metalling, allowing us a cover of 1 ft. 6 in. This small margin of cover was made possible by using a Mannesmann weldless tube, which will stand very heavy traffic without fear of fracture. By this method, all expensive gear and tackle was dispensed with, and the bridge was open to full traffic the whole time.

THE BRITISH MANNESMANN TUBE COMPANY'S WORKS.

A German Company started the first works at Landore, 34 years ago, and turned out between 3000 and 4000 tons of steel tubes per annum, finding employment for approximately 500 hands. To-day 30,000 to 35,000 tons of tubes are turned out per annum, and about 2000 men are employed. The above figures indicate that steel tubes have proved themselves, and are increasing in popularity daily. The demand was so great that the works were booked up in orders for six months in advance; but as they could only produce tubes up to 6 in. diameter, it was decided in 1917 to put down new works at Newport. These are now running at full pressure, employing over 1000 workpeople, and turning out 40,000 tons of weldless tube, from 6 in. to 13¼ in. diameter, and lapwelded tube from 12 in. up to 72 in., per annum.

THE MANNESMANN WELDLESS TUBE.

To commence with, solid round steel ingots or billets are used, these being assorted according to size and analysis; the actual size to be employed depending upon the size, gauge, and length of tube required. The size is therefore dependent on the weight of the billet, and, when determined, the billet is nicked all round by an oxy-acetylene flame, and then snapped under a 300-ton hydraulic press.

The billet is then charged into a gas-fired furnace, with an ultimate temperature of 1300° Fahr.; and when at the required heat, it is put through the piercer machine for conversion into a hollow bloom. The billet now contains a hole throughout its centre, and is slightly elongated. You will readily appreciate that the steel must be of the highest quality to stand the foregoing process. The power for the piercing machine is derived from a Cole Marchent and Marley compound tandem engine of 2500 H.P. through forty-two 2-in. diameter cotton ropes. The crank wheel is 11 ft. 6 in. in diameter, and the second motion wheel is 21 ft. 6 in. in diameter. From this machine, the pierced billet is automatically fed into either of the two mills; and here the actual pipe is rolled out without any joint or seam. Different rolls are put into the mill for the various size and gauge tube. The length of tube is governed by requirements, but a tube 12 ft. outside diameter by 87 ft. long has been turned out here.

After leaving the mill, the tube is straightened by skilled men, and then is finished off by having both its rough open end and pilger head cut off. Finally, each tube is tested under hydraulic pressure, sounded and gauged, and then immersed in a special hot solution of preservative mixture, and coated with jute previously soaked in the same solution. There are other departments specially set aside for flanges and special steam connections, branches, Y-pieces, &c.; and welding is done by oxy-acetylene quasi arc.

Such manufactures as telegraph and tramway poles, electric tramcar trolley arms, wireless masts, derricks, davits, bollards, &c., are treated as a separate department. The tube is heated in a gas-fired furnace, and is then hydraulically drawn through dies until it is stepped down to requirements.

In the lap-welded department, tubes from 12 in. up to 72 in. in diameter, and up to 25 ft. in length, and if necessary of 1 in. thickness, are manufactured. This lap-welding process is both cheaper and less complicated than the weldless one; the tubes being made from two plates bent to radius under special bending rolls. They are then sent to a welding machine, where the jointing of the two halves is accomplished by heat drawn from water gas, and are rolled or ironed by hydraulic presses. When the tubes are welded they pass into a gas-fired furnace, where they are brought to a blood-red heat for annealing, and are then rolled to take out any eccentricity. The ends are treated according to the future use of the tube, which is tested in a 2500-ton hydraulic press for soundness. It is finally immersed in a hot tar bath.

It may be of interest to know that the Company are now executing an order for 10,000 tubes for the Manchester Corporation. The tubes are 54 in. in diameter; each tube being 18 ft. long, absorbing ⅝ cwt. of tar, and requiring 100 yards of 12 in. width jute to cover it.

I am indebted to the management of the British Mannesmann Tube Company for the facilities they have afforded me in collaborating the few foregoing facts, and to Mr. H. D. Madden, M.Inst.C.E., Chief Engineer to the Cardiff Gas Light and Coke Company, and some of his staff, for their help in relation to figures and sketches in connection with the distribution part of this paper.

Discussion.

Mr. Armitage (Swansea) remarked on the somewhat flimsy nature of the work-docket, and thought that something more substantial might be an advantage. The number of men comprising service-laying gangs also seemed to be large. The system laid before them certainly had great advantages; and so far as costing was concerned seemed ideal.

Mr. Wood (Pentre) inquired what might be the position if one had to deal with "intellectuals" not up to the standard of education necessary to complete the dockets, giving some instances of personal experience in this connection.

Mr. T. A. Canning (Newport) mentioned that in regard to compilation of costs for estimating, past experience might certainly be useful; but the factor of varying circumstances should also be borne in mind. He would also like to know the method adopted for filing dockets for record purposes.

Questions dealing with the method of carrying out, and of costing, ground reinstatement work were raised by Mr. Hughes (Chepstow), Mr. Prater (Swansea), and Mr. A. W. Verity (Newport).

Mr. Collings (Swansea) asked for information on the lengths of free service. The case of a service requiring attention six months after laying or renewal, and which had been referred to incidentally by Mr. Clarry, might be put down to carelessness on the part of the servicelayer. He also thought the number of men comprising gangs was excessive.

Mr. Clarry, replying, said that with regard to the work-dockets, a case was provided for their preservation. So far as Mr. Wood's "intellectuals" were concerned, he could only say that their experience at Cardiff would appear to be more favourable than his. Various speakers had referred to the size of the gangs. Their system, however, was to deal with a number of services in a given area, and which were in close proximity one to the other. The servicelayer had an assistant; and three services might be dealt with by the one gang at the same time. The number of men comprising a gang was, however, a fluctuating one. Sometimes it might be six, but was seldom less than five. The records from the work-dockets were collated and posted into various books for permanency, so that the question of filing was not an important one. With regard to main-laying, a cost sheet docket similar to that for service-laying was in use. Replacements of road surfaces were generally carried out three or four days after service-laying operations. At Cardiff, with the exception of tar macadam, wood block, or stone set surfaces, they carried out their own reinstatements.

The President, in moving a vote of thanks to Mr. Clarry, said the paper had been most ably prepared and delivered, and would prove of great educational value. He also coupled in the vote of thanks the management of the British Mannesmann Tube Company for the opportunity given to the Association to visit their Newport works, and also to the members of the staff of the Company who had acted as their pilots.

Mr. T. A. Canning seconded the vote, which was received with acclamation.

Mr. Clarry responded, and thanked the members of the Association for the kind and attentive hearing they had given him. It might be that one was unable to convey anything really new; but his endeavour had been to lay before them something of a practical nature outside the scope of the text-books. Their Association was the first body to be afforded facilities to go round the Newport works.

Constant Heat Value in Gas.—According to the "American Gas Journal," the Gas Research Company have patented an apparatus for maintaining constant heat value in gas. A portion of the gas, which is to be maintained at a constant calorific value by dilution, is burnt, after dilution, at a constant rate, and the heat produced is utilized to regulate an electrical device. This in turn regulates the valve which controls the flow of gas under pressure. This valve is connected with the one which operates the supply line, feeding air to the gas. Both valves are controlled in this manner.

MIDLAND JUNIOR GAS ASSOCIATION.

The Annual Meeting of the Association was held at the Council House, Birmingham, on Thursday last—Mr. C. F. W. Rendle (Redditch) presiding.

The report and balance-sheet were formally approved, on the motion of Mr. L. Sturdy (Birmingham), seconded by Mr. R. G. Marsh (Birmingham)—points in the balance-sheet being explained by Mr. J. H. Gee (Treasurer).

Mr. Sturdy inquired whether, having regard to the satisfactory balance in hand, the Council would consider the advisability of reducing the amount of the subscription.

The President promised that the matter should have attention early next session.

The Senior Vice-President is Mr. L. H. Thomas (Nechells), and the Junior Mr. H. Clarke (Derby). With the appointment later on of the former as President, there will be the vacancy of Junior Vice-President; and for this position the Council submitted the name of Mr. J. H. Gee.

The President said Mr. Gee had, as Treasurer, done excellent work for the Association; and he was sure that eventually he would make an excellent President.

There were two vacancies on the Council, caused by the retirement, automatically, of Messrs. F. Caudwell (Shrewsbury) and W. B. Cobb (Birmingham); and Messrs. L. Sturdy (Birmingham) and E. H. Wright (Wolverhampton) were appointed to fill the vacancies.

Mr. H. R. Hems was re-appointed Hon. Secretary; and Mr. A. R. Myhill was elected Hon. Treasurer, in place of Mr. Gee.

To Mr. Hems and Mr. Gee a hearty vote of thanks for their services during the year was passed.

A similar acknowledgment was made to Mr. W. P. Timbrell for his continued service as Hon. Auditor, and to Mr. W. J. Pickering for his successful work in connection with the advertising propaganda.

This concluded the business of the annual meeting, and then followed a friendly discussion between the members of the works side and the distribution side on their respective duties and responsibilities. The discussion was opened for the works by Mr. L. H. Thomas (Nechells), and for the distribution side by Mr. R. G. Marsh (Fittings Engineer, of Birmingham). A large number of members took part in the discussion, which was of a more humorous than serious character; and the proceedings terminated with an effective summing up by the President.

All agreed that a very interesting evening had been spent, and that this kind of discussion—in this instance, it was private—would be useful in bringing the two sides closer to a mutual understanding of the difficulties and problems encountered by each.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The April gathering of the Yorkshire Junior Gas Association took the form of a visit to the Grappenhall works of the Richmond Gas Stove and Meter Company, Ltd. (a branch of Radiation, Ltd.), at Warrington, on Wednesday, April 18. The party were met at Manchester by representatives of the firm, and proceeded to Warrington by train, and were met at the station by motor conveyances. On the arrival at the works, the visitors, together with the Directors and representatives of the Richmond Company, were photographed. In the handsomely appointed board room of the offices, the visitors were given a cordial welcome by Mr. H. M. Thornton and Mr. J. W. Slack, Managing Directors.

Mr. Thornton remarked that it was not the first time the firm had been favoured by a visit from the Yorkshire Junior Gas Association, though there had been big changes in the works and buildings since the previous visit, ten years ago. He was glad to know how healthy and vigorous the Association remained. During the past ten years, the firm had made many additions and improvements; and he hoped that what the visitors saw would be of interest and benefit. He was sure it must be of considerable advantage to those engaged in the sale of gas appliances to see such apparatus in the making. Works visits were of immense benefit, both to the visitors and to the hosts; for they brought together the manufacturers of plant and appliances on the one hand, and on the other hand, the men who guided and advised consumers as to the equipment most suited to their needs. Mr. Thornton said all concerned in the Richmond undertaking were justifiably proud of their product and of their works; and he was sure the visitors would be impressed with the magnitude of the business, and with the high state of efficiency which had been attained by long experience and investigation. The Richmond Company, in keeping with the whole of the Radiation undertakings, were out to supply the gas industry and the public with the best gas appliances which could be produced.

Mr. J. W. Slack, endorsing Mr. Thornton's welcome, gave an outline of the nature and extent of the works, specially the new portions, and said that at last—at any rate, so far as they could see in meeting present and expected future business—they had a complete works, and one in which the various operations were carried out on the ground floor, thus abolishing waste of time and effort. This, of course, was a factor which would be appreciated by the members.

The visitors were then divided into parties, and were conducted over the plant under the guidance of Mr. Thornton, Mr. Slack, Mr. F. W. Richmond (Director), Mr. A. Slack (Director and Secretary), Mr. C. G. Langford (Works Manager), Mr. H. Park (Assistant Works Manager), Mr. A. A. H. St. Leger, Mr. H. Sherburn, Mr. W. H. Tickell, Mr. G. Horrocks, and Mr. E. Richings.

The visitors were taken first to the furnace department, where they were shown many types of gas-furnaces, both finished and in course of construction. The parties were taken through the engineering shop, the smithy, and the plumbers' and joiners' shops, where the Company carry out all general and works repairs. The system of costing and accountancy, which provided for the most economical running of these departments, was explained. In the broken and scrap-iron yard, the guides went into details of the firm's method of testing broken castings to make sure there is no reason to blame the composition of the metal. In the core-making department it was seen that a staff of highly-trained girls were employed, and it was interesting to note that the cores, after moulding, were dried in open gas-heated ovens for twenty-four hours.

The whole of the processes preparatory to, and during, the enamelling of the finished appliance were explained and seen in operation in the enamelling shop. The preparation of the flux, the furnace processes, the large revolving drums and the baths, the spraying of enamel on to the plates by the aid of compressed air, and the drying in the furnace—all these were viewed with interest. Tile-pattern back-plates for stoves and doors were seen in the making. The enamelling of gas-rings was shown to be a process quite distinct from that of plates; the rings, after heating in a gas-furnace, being coated with powdered enamel. This method was applied also to gas-fires and cooker stands. In the moulding shop, where there was a scene of great activity, it was explained that from 39 to 40 tons of iron are melted per day; and the whole output is subjected to laboratory tests to ensure a perfect metal. Patterns of all kinds were examined in the pattern shop, and an excellent system of storing and classification, for ready access, was noted. The drawing offices, the machine shop, and the erecting shop were visited. The care with which the products of the Richmond Company are subjected to examination and test—specially with taps and other brass parts—was noted in the testing-room; and an experiment on a new gas-fire burner, of which the firm have great hopes, was seen.

Tea and Speeches.

The visitors were entertained by the firm to tea in the offices.

Mr. W. Heathcote (Halifax), Senior Vice-President, apologized for the absence of the President (Mr. H. L. Bateman, of Wakefield), and expressed the keenest appreciation of the hospitality of the Richmond Company, and the freedom with which they had thrown open their works to the inspection of the members of the Association. The visit had been highly instructive. He himself had been present on the occasion of the visit to the old Academy Street works ten years ago; and the present works were a striking demonstration of the remarkable advances which had been made during the past decade in the manufacture of gas appliances. The Richmond Company were to be congratulated on their organization, and on the care they expended. Mr. Heathcote made special reference to the new "Hollar" boiler—an appliance of many excellent qualities, and one which, after what they had seen that day, any salesman could recommend in his own district with complete confidence. He believed there was a great field for this appliance.

Mr. S. H. Packer (Bradford), proposing the thanks of the gathering to the firm and to the gentlemen who had acted as guides, said that in the train coming to Warrington, he had read a humorous article in a business magazine, entitled "Is Your Firm in a Twilight Sleep?" He had arrived at an undertaking which was certainly not in a twilight sleep—a firm whose organization and efficiency were such as the visitors would long remember. As a salesman, he had come with a special desire to note developments in the making of hot-water appliances, and, like Mr. Heathcote, he had been greatly impressed by the new "Hollar" boiler. He was sure it was a line which would meet a great demand. He wished to move, on behalf of the Association, a hearty vote of thanks to the Directors and staff of the Richmond Company.

Mr. S. T. S. Musgrove (Sheffield) seconded the motion, and said that there was no doubt the more the various parties concerned in serving the public could get together, the more they would understand each other's point of view, and the better would be their service. Sometimes salesmen thought the manufacturers of appliances were rather a nuisance, specially when one had to wait a long time for the delivery of goods on order; but after what the visitors had seen that day of the mass of detail and the care required in the production of apparatus, he fancied they would be a little more considerate. They had all been greatly impressed by the works and the manner of production, and he was sure they must have learned a good deal which would be useful in their work of handling or selling the Richmond appliances.

Mr. F. W. Richmond, responding, said the firm appreciated the thanks of the visitors. He apologized for the fact that Mr. Thornton and Mr. Slack had had to leave for London, and therefore could not respond personally, but he would certainly convey to them and to their fellow Directors the thanks of the visitors. The Company were very proud of their whole undertaking, and specially of the newer sections; and he could assure the members of the Association that it was the Company's constant endeavour to produce only the best of appliances. He thought the reputation of the Richmond products indicated that in this direction they had achieved a considerable amount of success.

Mr. Arthur Slack (Director and Secretary) endorsed Mr. Richmond's remarks, and expressed the hope that every member of the Association would take away some knowledge which would prove useful to him.

THE MANUFACTURE OF NEUTRAL SULPHATE OF AMMONIA BY DIRECT ABSORPTION.

The "Iron and Coal Trades Review" draws attention to the increasing demand in the agricultural world for dry, neutral sulphate of ammonia—a demand which cannot fail to grow in proportion as the properties of neutral sulphate become more widely known.

The dry, neutral sulphate has many advantages over the wet acid salt—in particular: (1) Increase in content of ammonia from 25 to 25·5 p.ct., giving an increased value of 6s. per ton. (2) Absence of acid, increasing the value of the salt by 7s. per ton. An acid-free salt can be readily dried; and the physical properties of dry salt, such as its freedom from lumps, further materially increase its selling value. There is also a considerable economy possible in bagging, since the dry salt does not rot the bags. The double-twill bags necessary for the transport and storage of wet, acid sulphate may be supplemented by single-hessian bags, which would cost less than a third of the price of the double bags, resulting in an economy of approximately 13s. per ton of salt. On the question of economy in the manufacture of neutral sulphate, it is hardly necessary to add that evaporation of neutral liquor reduces the corrosion on the evaporators to a negligible quantity.

The process under notice was devised by the owners of a large Mond gas plant installation in Scotland; and the advantages enumerated are the results of working experience over a period exceeding five years. The process is now being exploited by the Power Gas Corporation, Stockton-on-Tees. The method employed is essentially a direct absorption process; the absorption of the ammonia from the gas being carried out in two separate compartments. The raw gas (from which no ammonia has been absorbed) is treated with liquor which is practically neutral; while the gas is finally stripped of its ammonia in the second compartment. In other words, the liquor of the first compartment is being neutralized by the gas, while in the second compartment the gas is being stripped of its ammonia by acid liquor. As carried out in a Mond plant, there has been proved to be no loss of ammonia in the absorption—the absorption efficiency of the apparatus being 99·17 p.ct. in tests over a period of five years. The sulphate, as made in the evaporators, has an average ammonia content of 25·28 p.ct. NH_3, and acid content of 0·0127 p.ct. H_2SO_4. After drying, the ammonia content rises to 25·57 p.ct. NH_3, and the acid content drops to 0·0113 p.ct. H_2SO_4.

From the foregoing, there would appear to be no doubt that this system is a satisfactory way of making neutral sulphate by direct recovery, such as is used on a bye-product recovery gas-producer plant; but why should not something similar be introduced in the working of direct-recovery coke-oven or town-gas plants?

Spontaneous Combustion of Bituminous Coal.

A note from the United States Bureau of Standards in the "Journal of the Franklin Institute," by Mr. Joseph D. Davis, dealing with the "Spontaneous Combustion of Bituminous Coal," states that safe storage of bituminous coal, which is probably the only solution of stabilizing the coal industry, involves means to overcome hazards of spontaneous ignition when coal is stored in large piles. On account of the divergence of opinion and the variety of methods proposed for storing coal, the Bureau of Mines, in co-operation with the Carnegie Institution of Technology, have conducted a laboratory study of the factors involved in spontaneous combustion of bituminous coal. One of the principal objects was to determine why some coals ignite more readily than others. A laboratory test was devised for determining the relative tendency of coals to fire spontaneously, and this "critical temperature" test was applied to many coals. The conclusions reached as a result of this study are that fine coal dust and moist air quickly increase the hazards of spontaneous combustion. Coal finer than 200 mesh has a critical temperature of 171° C.; while coal between 10 and 20 mesh has a critical temperature of 231° C. Coal coarser than ¼ in. showed no rapid self-heating. Therefore the presence of fines in a coal pile should be avoided. Moisture in the air or coal facilitates oxidation and consequent heating. Pyrites in lump form has no dangerous effect in coal. Mixtures of fresh and partly oxidized coal heat no more rapidly than fresh coal. The "anthraxylon" or "woody" constituents of the coal have a lower critical temperature than the "attritus" constituents; but more investigation is needed to evaluate the readily oxidizable constituents in coal, and thus determine which are the more responsible for spontaneous heating. The critical temperature method evolved for testing coals seems suited for grading their relative tendencies to fire spontaneously; and the Bureau of Mines expect to develop this method further, and apply it in a survey of the coals of the United States.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Need for Strenuous and Persistent Effort.

Sir,—A case recently came to my notice in which a large estate with some hundreds of new houses (with many more to be built) and 1500 inhabitants has no gas supply, though situated quite conveniently to a neighbouring gas undertaking. The owner of the estate, who appeared to be an enterprising business man, told me—and this is the serious part—that he considered that "gas was a back number," and that he had not seriously gone into the matter, though he had provided an electricity generating supply for the estate.

We who know that gas must have a wonderful future in front of it are sometimes accustomed to assume that the public generally have a knowledge concerning gas and its importance in modern life which is not borne out by actual experience. The fact is, that while much new business comes without any trouble on our part, there is yet a great deal which cannot be obtained without strenuous and persistent effort.

119, *Victoria Street, S.W., April* 28, 1923. G. M. Gill.

Therm Calculations.

Sir,—I am sorry to trouble you again, but since last writing I have noticed something further which may be of service in connection with this subject.

For instance, it may be required to know what fraction of a therm one gets (or supplies) for 1d. and/or 1s., assuming a meter passes (say) 20 ft. for 1d.

This information can be seen by glancing at the therm table.

20 c.ft. = $\frac{1}{10}$ of 200 c.ft. = ·90 therefore 1d. = ·09
240 ,, = $\frac{1}{10}$ of 2400 ,, = 10·80 ,, 1s. = 1·08

In the case of a 16 c.ft. for 1d. meter, take $\frac{1}{100}$ of 1600 c.ft.—*i.e.*, ·07$\frac{1}{2}$

Bournemouth Gas and Water Company, April 26, 1923. G. W. Limmer.

Crude-Oil Engine Running Costs.

Sir,—In the current number of your supplement "The Gas Salesman," you publish Mr. W. A. Bishop's reply to the discussion on his paper on "Competition," and mention is made of crude-oil engines and their performance.

In this connection, I would point out that the makers of these engines guarantee an efficiency of 1 B.H.P. per hour with ½ pint or less of crude oil (engines of 10 H.P. and above). As crude oil can be bought at a price of less than half that quoted for paraffin, or about 8d. per gallon, it makes these engines much cheaper than gas-engines, unless gas is supplied to give 9000 B.Th.U. at the same price as ½ pint of crude oil or 9000 B.Th.U.

As this means a price for gas of 5½d. per therm, it is only in such fortunate places as Bath or Sheffield that crude-oil engine competition can be effectually met.

Gas-Works, Teignmouth, April 30, 1923. H. Higham.

REGISTER OF PATENTS.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 25.]

Nos. 10,230 to 10,900.

Ainsworth, A.—"Gas and air mixing apparatus for internal combustion engines." No. 10,643.
Alexander, H.—"Carbonizing coal." No. 10,780.
Alexander, W.—"Gas-meters." No. 10,803.
British Mannesmann Tube Company, Ltd.—"Loose-flange pipe joints." No. 10,713.
Clark, F. W.—"Manufacture of gas from coal, &c." No. 10,879.
Cross, L. H.—"Process for separation of tar and preparation of paint therefrom." No. 10,870.
Feneley, C.—"Gas-heated appliances." No. 10,758.
Gallon, M. E.—"Fittings for ascension pipes for furnaces, &c." No. 10,731.
Gilbody, F. H.—"Valves for fluids, gases, &c." No. 10,372.
Helps, G.—"Gas burners and cookers." No. 10,810.
Lucas, O. D.—"Retorts." No. 10,685.
Pinchbeck, Ltd.—See Alexander, W. No. 10,803.
Ross, J. H.—See Feneley, C. No. 10,758.
Smith, H. E.—See Alexander, H. No. 10,780.
Stewart, J. G.—"Gas-testing apparatus." No. 10,726.
Tague, G. O.—See Cross, L. H. No. 10,870.
Travers, M. W.—See Clark, F. W. No. 10,879.
Vickers, Ltd.—See Lucas, O. D. No. 10,685.
Williams, A. W.—See British Mannesmann Tube Company, Ltd. No. 10,713.
Wollaston, T. R.—"Device for deflecting, opening, and crushing fuel, &c., for distillation, &c." No. 10,366.
Younger & Gallon.—See Gallon, M. E. No. 10,731.
Zschocke Werke Kaiserslautern-Akt.-Ges.—"Centrifugal apparatus for treatment of gases." No. 10,391.

Automatic Gas Producers has been registered with a capital of £20,000, to carry on business as manufacturers of producer-gas plants. The address is: Phœnix Works, Oakfield Road, Altrincham.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Swanage Gas and Electricity Bill: The opposition to the Bill having been withdrawn, the Orders previously made have been discharged, and the Bill committed.

Smethwick Corporation (Gas) Bill: Reported, without amendment; read the third time and passed; sent to the Commons.

South Oxfordshire Water and Gas Bill: Returned from the Commons, agreed to.

South Elmsall and District Gas Bill: Committed.

Oakham Gas and Electricity Bill: Reported, with amendments.

HOUSE OF COMMONS.

Progress of Bills.

South Oxfordshire Water and Gas Bill: Read the third time, and passed, without amendment.

Smethwick Corporation (Gas) Bill: Read the first time, and referred to the Examiners.

Bill Royal Assented.

The South Oxfordshire Water and Gas Bill received the Royal Assent on Thursday of last week.

Macclesfield Corporation Bill.

A report was read and agreed to that the Standing Orders not complied with in respect of the petition for additional provision in the Macclesfield Corporation Bill should be dispensed with, and leave given to the Committee to insert the additional provision.

Gas Regulation Act.

A copy was presented of a draft of a Special Order proposed to be made by the Board of Trade, under section 10 of the Act, on the application of the Barnsley Gas Company.

Public Utility Companies (Capital Issues) Act.

A copy was presented of a report by the Board of Trade, under the Act, on an application by the Scarborough Gas Company.

Crude Gas Tar for Roads.

Lieut.-Colonel Campion asked the Parliamentary Secretary to the Ministry of Transport why, in view of the satisfactory results obtained by the use of ordinary crude gas tar, the Roads Department insisted on local authorities using dehydrated or refined tar on roads under their jurisdiction at a higher cost to the ratepayers?

Colonel Ashley said he was not prepared to admit that the use of ordinary crude gas tar for road works had been generally attended with satisfactory results. Many instances to the contrary could be quoted, especially in areas where roads drain into fishing streams. In order to secure a tar of known constituents and ascertained qualities, a specification had been drawn up by his Department, after consultation with representatives of the interests concerned; and, while local authorities were not debarred from using crude tar, the observance of the Roads Department specification was a condition attaching to all grants made from the Road Fund.

Coke-Ovens.

Lieut.-Colonel Lane-Fox, replying to Mr. Hardie, stated that the number of coking-ovens idle in Great Britain in March was about 2000.

Smokeless Coal.

Mr. Hardie asked the Minister of Health whether he was aware that coal could be treated and left smokeless, and, weight for weight, gave the same heat as raw coal, also that the smoke was condensed into marketable commodities; and whether his Department would frame a scheme for the scientific treatment of raw coal?

Mr. Chamberlain replied that he was aware of the scientific facts referred to; but he was advised that the formulation of a practical scheme for such a treatment of coal must await the solution of engineering problems which have been, and were still, engaging the active attention of the Fuel Research Board and independent workers.

Mr. Hardie further asked Mr. Chamberlain if he would consult the chief of the Fuel Research Board and ascertain whether he has not seen at work a plant which overcomes all engineering difficulties.

Mr. Chamberlain said he would make inquiries.

CITY AND SOUTH LONDON RAILWAY BILL.

Petition by the South Metropolitan Gas Company.

This Bill, to empower the City and South London Railway Company to extend their line from Clapham Common to Morden, the greater part of which will be underground, and to confer upon the Company running powers over the line of the Wimbledon and Sutton Railway (which is authorized but not yet constructed) from Morden to Sutton, has been before a Committee of the House of Commons, presided over by Sir Park Goff, since Wednesday last. The South Metropolitan Gas Company, whose limits of supply include the greater part of the Administrative County of London south of the Thames, petitioned on the ground that they would be injuriously affected by the Bill, and submitted that the powers of executing works sought by the Bill should only be granted subject to the insertion of provisions for protecting to the fullest extent their mains, pipes, and apparatus, for compensating them for any injury, loss, or damage, and indemnifying them against any additional expense resulting from the exercise of the powers of the Bill. The petition was not dealt with in Committee, however, in view of the fact that the parties were confer-

ring with the object of agreeing upon a clause which would satisfy the Gas Company.

In the petition it was stated that lands and property of the petitioners might be compulsorily acquired or used under the powers sought by the Bill. The underground railway was proposed to be constructed under certain premises held on lease by the petitioners, and used for the purposes of offices and showrooms in connection with their undertaking; and the Railway Company sought power to acquire compulsorily easements and rights in and under the property, though the petitioners apprehended that the Railway Company might so alter the line as to avoid the necessity for acquiring any such easements from the petitioners. The construction and working of the underground railway would, or might, cause structural damage to the premises of the petitioners, who were not satisfied that the provisions of the Bill adequately protected them in respect of any such damage, or provided for the payment of full compensation for damage.

The limits of deviation for the works to be authorized by the Bill included numerous streets and roads in and under which mains, pipes, and apparatus of the petitioners were laid. Many of these were of large dimensions, and any injury to them, or any interruption of, or interference with, the flow of gas therein, would result in serious public and private inconvenience. Also, the Railway Company would obtain extensive powers of opening and breaking up the surface of streets and of constructing works under them, and would be enabled to alter or interfere with the mains, &c., of the petitioners; but the Bill did not contain provisions which would adequately protect the latter. Owing to the wide powers of lateral and vertical deviation sought by the Bill, the petitioners were unaware of the exact nature and extent of the interference with their mains, &c., which would be involved in the construction of the proposed works; but it was inevitable that such construction would involve a substantial amount of interference with them. The petitioners particularly apprehended risk of injury to their mains, &c., arising out of the construction of escalators and inclined passages under streets and roads or land adjoining streets and roads. They believed that, owing to the necessity for constructing on a steep incline the tunnels in which escalators were to be provided, it would be impracticable to use shields such as were used in driving horizontal tunnels for the underground railway; and the methods prescribed in the Bill for the construction of such tunnels and the lining and grouting thereof, could not be adopted in such cases or in the case of any such inclined passages as might be constructed. The petitioners apprehended that such works would necessarily be constructed under such conditions as to give rise to greater risk of subsidence to the surrounding subsoil than would occur in the construction of works to which the methods prescribed could be applied.

The provisions of the Bill relating to the method of dealing with underground water which might be encountered in the course of constructing the proposed works were unsatisfactory, and were not such as to ensure the prevention of serious subsidence arising from the abstraction of water from the water-bearing beds which existed to a large extent on the southern side of the Thames. The petitioners submitted that it would be inexpedient to sanction the proposed works except subject to more stringent conditions than those contained in the Bill, for preventing the abstraction or discharge of underground water to such an extent as to cause unnecessary risk of subsidence.

Under the provisions of a clause in the Bill giving the Railway Company power to deviate vertically (stated the petitioners), the Railway Company might deviate vertically from the levels of the intended works as to bring the works within a distance of less than 20 ft. from the surfaces of streets or roads, subject only to the qualified necessity of obtaining the approval of the road authority to plans and sections of the intended works. The Railway Company would not be required to obtain any approval by the petitioners of their proposals to construct works at a short distance below the surfaces of streets and roads, notwithstanding the existence of important mains, pipes, and apparatus of the petitioners in that portion of the under surface of streets and roads which the Railway Company might require to use. It was submitted that the Railway Company should not be permitted to construct their works at such a level as to necessitate the diversion of the mains, pipes, and apparatus of the petitioners, and that provisions should be inserted in the Bill requiring the Company, except with the consent of the petitioners, to construct their works at such a depth beneath the surfaces of streets and roads as to prevent the necessity for any such diversion.

Again, in the execution of the powers sought by the Bill, the Railway Company might alter the position of mains, &c., of the petitioners so as to leave over them an insufficient amount of covering to protect them from injury by frost or traffic, or, on the other hand, so as to leave them at such a depth below the surface as to render access thereto by the petitioners difficult and costly. The petitioners submitted that in any case in which it was necessary for the Railway Company to alter either the mains of the petitioners or the ground over or near them, definite limits should be prescribed as to the maximum and minimum depths of cover to be left overlying them.

It was proposed, in one of the clauses of the Bill, to apply to the underground railway and works certain of the provisions of the City and South London Railway Act, 1903, including section 72, which was enacted for the protection of water, gas, hydraulic power, and electric companies. It was submitted that the provisions of that section would not afford complete protection to the petitioners, and this the powers sought by the Bill should not be conferred otherwise than subject to such conditions as would fully protect the petitioners and their property.

The clause agreed between the Railway Company and the South Metropolitan Gas Company is as follows:

For the protection of the South Metropolitan Gas Company (in this section referred to as "the Gas Company") the following provisions shall, unless otherwise agreed in writing between the Gas Company and the Company, have effect (that is to say):

(1) The Company shall not remove, raise, sink, or otherwise alter the position of any mains, pipes, valves, hydrants, plugs, or other works or apparatus (in this section referred to as "apparatus") of the Gas Company, or do anything which may impede the passage of gas into, or through, the same, without the consent in writing of the Engineer of the Gas Company (in this section referred to as "the Engineer") or in any manner other than the Engineer shall approve, nor (with such consent and approval) until such good and sufficient apparatus as the Engineer may consider necessary for continuing the supply of gas has been first provided, laid down, and made ready for use to the reasonable satisfaction of the Engineer.

(2) The Company, in executing any works under this Act or in removing, raising, sinking, or otherwise altering the position of any apparatus of the Gas Company, shall make good all damage done by them to the apparatus or other property of the Gas Company, and shall make reasonable compensation to the Gas Company for any loss or damage which they may sustain by reason of any interference with their apparatus or property.

(3) All works to be executed or provided in connection with any apparatus of the Gas Company shall be so executed and provided by, and at, the expense of the Company, but to the reasonable satisfaction and under the superintendence (if after reasonable notice he should choose to attend) of the Engineer; and the reasonable costs, charges, and expenses of such superintendence shall be paid by the Company.

(4) The provisions of the section of this Act, of which the marginal note is "Compensation for damage by working," shall extend and apply to the apparatus of the Gas Company as if the same were expressly included in such lands, houses, and buildings as are referred to in that section.

(5) If any difference shall arise between the Company and the Gas Company under the provisions of this section (other than subsection (4) thereof, or any difference as to the construction or meaning of the said provisions), such difference shall be settled in accordance with the provisions of sub-section (8) of section 72 of the Act of 1903 as modified by this section.

(6) The provisions of this section shall, except as otherwise expressly provided, be in addition to, and not in substitution for or derogation of, any other provision of this Act to the benefit of which the Gas Company would otherwise be entitled.

This clause will come before the Committee later in the week.

OAKHAM GAS AND ELECTRICITY BILL.

This Bill, which is to empower the Oakham Gas Company, Ltd., to change its name to that of the Oakham Gas and Electricity Company, Ltd., to empower the Company to supply electricity, and to make further provisions with regard to the supply of gas, was ordered to be reported for third reading by the Unopposed Committee of the House of Lords, presided over by the Lord Chairman, the Earl of DONOUGHMORE, on Tuesday, April 24, subject to the approval by the Lord Chairman of a number of new clauses which have been added.

The preamble of the Bill stated that the Oakham Gas Company, Ltd., are supplying gas within the urban district of Oakham and part of the rural district of Oakham, in the county of Rutland, under powers conferred on them by the Oakham Gas Orders, 1888 and 1915; that the supply of electricity by the Company within that area would be of public and local advantage; and that it was expedient that they should be empowered to afford such a supply.

It is provided in the Bill that the area for the supply of electricity by the Company shall be the area in which they are now authorized to supply gas—namely, the urban district of Oakham, and the parishes of Barleythorpe, Langham, Whissendine, Ashwell, and Braunston, and part of the parish of Burley, all in the rural district of Oakham. The supply is to be for all public and private purposes. Power is given for the erection and working of a generating station on the lands on which the Company are now authorized to manufacture gas, and a proviso has been added providing that the Company are not to be relieved from the necessity of obtaining the consent of the Electricity Commissioners, under section 11 of the Electricity (Supply) Act, 1919, to the establishment of a new, or the extension of an existing, generating station. Power is given to break-up certain streets not repairable by the local authority and the railways, subject to provisions which are incorporated in the Bill.

With regard to the laying of distributing mains, it is provided that the Company shall, before the expiration of three years after the passing of the Act, lay suitable and sufficient distributing mains for the purposes of general supply through certain streets mentioned in the schedule (all in the urban district of Oakham). The Ministry of Transport may, on the expiration of this period, if mains have not been laid in these streets, or if evidence is not forthcoming of the *bona-fide* intention of the Company to lay such mains, revoke the powers of the Act in regard to the supply of electricity in the urban district of Oakham. If, at the expiration of five years after the passing of the Act, the Company have not laid suitable and sufficient distributing mains for the purposes of general supply in any parish in the rural district of Oakham included in the electricity limits, the Minister of Transport may revoke the powers of this Act in regard to the supply of electricity in that parish. The maximum prices to be charged by the Company shall be, in respect of the quarters ending March 31 and Dec. 31, for any amount up to 15 units, 15s., and for each additional unit 1s.; and in respect of the quarters ending June 30 and Sept. 30, for any amount up to 10 units, 10s., and for each additional unit 1s. The prices are subject to alteration in accordance with the provisions contained in the schedule to the Electricity (Supply) Act, 1922.

Powers are given to erect sub-stations under public streets, and to lay electric lines in private streets. The Company may also purchase, manufacture, provide, sell, let on hire, and otherwise deal in electrical apparatus; and sections of the Company's Order of 1915 which apply to the gas undertaking, with regard to consumers giving notice to undertakers before removing, power to refuse supply to persons in debt for other premises, and notice to discontinue supply, shall also apply to the electricity undertaking.

As to the supply of gas by the Company, it is provided that they may require a consumer of gas used for the working of an engine to fix and use an efficient anti-fluctuator, and if he fails to do so, may cease to

supply him. The usual clause with regard to laying gas-pipes in private streets is included. A new clause provides that the Company shall, within one year from the passing of the Act, apply to the Board of Trade, under section 1 of the Gas Regulation Act, for an Order for the purposes mentioned in that section.

Coming to the financial provisions, the Company are empowered to raise further share capital not exceeding £9000, including premiums which may be obtained on the sale of any shares or stock, provided that the share capital shall not exceed, in the whole, £27,000. As to borrowing powers, the Company may borrow on mortgage of the undertaking, in respect of the shares and stock issued prior to the passing of the Act, a sum not exceeding (inclusive of the sums borrowed prior to the passing of the Act) the total of £6500, and also a sum not exceeding half the amount which at the time of borrowing has been actually received by the Company (including premiums) on any ordinary and preference shares and stock issued after the passing of the Act. If, within a period of two years after the passing of the Act, or such extended period as the Electricity Commissioners may prescribe, the Company shall have failed to commence to exercise the powers of the Act with reference to the supply of electricity, the additional capital which the Company are authorized to raise by the Act shall be reduced from £9000 to £3000, and there shall not be created any greater amount than £3000 till they commence to exercise those powers. Separate capital and revenue accounts are to be kept of the gas and electricity undertakings, and the Company shall, out of the capital raised, carry to the credit of the capital account of the gas undertaking a fair proportion of the value of all land and buildings acquired or erected for the purposes of the undertaking and used also for the purposes of the electricity undertaking.

The standard rates of dividend (both on gas and electricity capital) on ordinary shares and stock are 10 p.ct. per annum on that constituting the original capital of £8000 authorized by the Company's Order of 1888, and 7 p.ct. on all other ordinary shares and stock. The prescribed rates to be paid on preference shares and stock are 5 p.ct. per annum on that issued under existing Orders prior to the passing of this Act, and such rate as may be determined by the resolution creating the shares and stock, but not exceeding 7 p.ct. per annum, on that issued subsequently. In the case of the gas undertaking, the sliding-scale is to operate. The standard price for gas within the inner area of supply —*i.e.*, the area within the urban district of Oakham, and the parishes of Barleythorpe, Langham, and Burley—is 4s. 6d. per 1000 c.ft., or such other price as may be prescribed by the Board of Trade under the Gas Regulation Act. The prices to be charged for gas within the parishes of Braunston, Whissendine, and Ashwell shall not exceed the prices charged to consumers in like circumstances within the inner area, by more than 6d. per 1000 c.ft. The Company may, however, charge in those parishes less than they are authorized to charge, provided that such reduced prices are not at any time less than the prices charged to consumers in like circumstances in the inner area.

Among the general provisions of the Bill is a clause providing that if the local authority, as defined in the Electric Lighting Act, 1882, shall within six months after the expiration of a period of 42 years from the passing of this Act, or within six months after the expiration of every subsequent period of 10 years, give notice in writing to the Company under section 2 of the Electric Lighting Act, 1888, requiring the Company to sell to them the electricity undertaking, then the local authority may, and shall at the same time, purchase the gas undertaking. The price to be paid for the electricity undertaking in such event shall be determined in accordance with the provisions of section 2 of the Electric Lighting Act, 1888; and the price to be paid for the gas undertaking shall be agreed between the Company and the local authority, or, failing agreement, it shall be the then value of the gas undertaking as a going concern, to be determined in accordance with the provisions of the Arbitration Act, 1889. Nothing in this section or in the Electric Lighting Act, 1888, shall extend to authorize the local authority to purchase (except by agreement) any fittings business carried on by the Company, or any lands, buildings, works, &c., belonging to, or used by, the Company, exclusively for the purposes of that business.

Various sections of existing Orders of the Company are repealed.

Another part (Part II.) has been added to the original Bill, containing a number of financial provisions which are not to come into force until after the termination of three years from the time the Company have commenced to supply electricity under the powers of Part I. One clause provides that the Company shall keep in their books an interest and dividend account, to which they may in every year transfer from the profit and loss accounts of the gas and the electricity undertakings respectively certain sums. All interest and dividends on the share and loan capital of the Company shall be paid only out of that account.

SMETHWICK CORPORATION (GAS) BILL.

This Bill was ordered to be reported for third reading by the Unopposed Committee of the House of Lords on Tuesday, April 24. (See "Journal" for March 7, p. 619, and March 21, p. 772.) There were no amendments.

Reconstructing Smethwick Gas-Works.—The question of the reconstruction of the gas-works was before the Smethwick Town Council on Tuesday of last week, when the Chairman of the Gas Committee (Mr. S. W. B. Stephen), explaining the recommendation of the Committee that application be made to borrow £45,668 for the necessary work, said it was part of the scheme sanctioned by the Council in March last; and the amount named was a portion of the £180,000 which the Council then agreed should be borrowed. The purchase of land for the new gasholder had now been settled; and there was no opposition to the Bill they had in Parliament, which they trusted would soon go through. He mentioned that the publicity campaign had been very successful; the increase in the sales of gas appliances being roughly 150 p.ct. In connection with the relaying of mains in certain streets, the total cost was estimated at £10,730.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade for Orders under the Gas Regulation Act.

Abertillery Urban District Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 8d. per therm.

Hawkhurst Gas Company, Ltd.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 9d. per therm.

It is also proposed that additional charges per therm should be authorized in respect of gas supplied through a prepayment meter.

Loughborough Corporation.

The maximum price authorized in respect of the supply of gas by the undertakers under their Act of 1899 is 3s. 6d. per 1000 c.ft.; and by their Temporary Increases of Charges Order, 5s. 3d.; and the price they have asked the Board of Trade to substitute for this is 1s. 8d. per therm.

It is also proposed that an additional charge of 2½d. per therm should be authorized in respect of gas supplied through a prepayment meter.

SPECIAL ORDERS.

Uxbridge, Wycombe, and District Gas Company.

The Company notify their intention to apply to the Board of Trade for a Special Order under section 10, to provide for the transfer to them of the undertaking of the Maidenhead Gas Company, and to extend the limits of supply.

Whitchurch (Salop) Gas Company, Ltd.

The Company are applying for a Special Order to enable them to use scheduled lands for gas-works purposes, to raise further capital, to charge differential prices, and to regulate the supply of gas.

GAS REGULATION ACT ORDERS.

The Director of Gas Administration has forwarded copies of the following further Orders made by the Board of Trade under section 1 of the Gas Regulation Act.

Abergavenny Corporation.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 16d. per therm. (April 19)

Chesterfield Corporation.

After the declared date, the maximum prices in respect of gas supplied by the undertakers shall be 12d. within the borough of Chesterfield as constituted at the date of this Order, and 13·5d. per therm outside this area. (April 21.)

Southwell District Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 14·8d. per therm.

For the purpose of ascertaining the authorized rate of dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by five-and-one-fifth. (April 17.)

Wells Gas Light Company.

After the declared date, the maximum prices in respect of gas supplied by the undertakers shall be 16·8d. per therm and 18·2d. per therm; and these prices respectively shall be substituted for the prices of 5s. and 6s. per 1000 c.ft. mentioned in section 56 (maximum price of gas) of the Wells Gas Act, 1867.

Prepayment meter clauses are included. (April 23.)

Stokers' Conditions at Skipton.—The Skipton District Council have received an intimation from the Regional Gas Industrial Council stating that the Council have been asked to arbitrate in regard to the arrangement at the Skipton Gas-Works for the attendance of stokers for the boiler and exhauster during the six summer months. The arrangement is not satisfactory to the men. The Council were asked whether they would accept the decision of such arbitration, and have applied for a copy of the resolution passed by the Regional Council on the subject, on receipt of which the Gas Committee again will meet to consider the position.

Meter Testing in Middlesex.—The annual report of the Middlesex County Council for the year ended March 31 last, states that since the Gas Regulation Act came into operation, 1,730,709 meters have been tested, and fees amounting to £58,538 have been received. During the year, 84,200 meters were tested; an increase for the year of 2396. The number of meters submitted for test by gas companies and others, for which certificates are demanded, increased to such an extent that overtime was necessary for twenty weeks. Notwithstanding this, the department are still unable to meet all the requirements of the Tottenham District Light, Heat, and Power Company; and the question of enlarging the gas-meter testing station is now under consideration.

WESTMINSTER CITY COUNCIL AND GAS MAINS AND FITTINGS.

The Question of Inspection.

The General Purposes Committee reported to the Westminster City Council on Thursday last, that they had considered a letter dated March 7 from the Metropolitan Boroughs Standing Joint Committee, communicating the conclusions arrived at by a conference of representatives of various bodies (including the Standing Committee) relative to defects in gas-mains, escapes of gas, and gas-fittings, and recommending the Council to agree with them.

The conference were of opinion that the subjects referred to should be considered by the bodies represented at the conference.

The question of defects in gas-mains, the Committee stated, was being considered by the Works Committee.

As to the steps to be taken to impress upon the public that all escapes of gas of uncertain origin should be immediately reported to the gas undertaking of the district, and to acquaint the public with the best means of making such reports promptly, the conference were of opinion that gas undertakers should consider what additional means they could adopt to bring effectively to the notice of consumers the danger arising from escapes of gas; and they suggested that this might be done by printed notices in red on the face of the gas account, and affixed to the consumer's meter. Further, it was suggested that, wherever practicable, arrangements should be come to by which notifications of leaks might be made immediately to the police or the nearest fire brigade station, and thence passed on at once to the gas undertakers; and that local authorities should be asked to instruct their employees to report immediately any indications of escapes of gas which came to their notice.

With regard to the question of the inspection of gas-fittings and the discouragement of the use of dangerous types of apparatus or apparatus fixed in a dangerous manner, the conference thought that it should be taken into consideration whether gas undertakers should be given powers which would enable them: (*a*) To prescribe the size and material of pipes for internal installation work on the lines of section 33 of the Gas Light and Coke Company's Order, 1922; (*b*) to inspect the piping and gas-consuming appliances and the fixing thereof in any consumer's premises, and to refuse to give or continue to give a supply of gas to such premises if such piping, appliances, or fixing were found dangerous, and the consumer refused or neglected after notice to make the necessary alterations.

On the recommendation of the General Purposes Committee, the Council agreed with the conclusions arrived at by the conference with regard to escapes of gas and gas-fittings.

The Works Committee reported that the Standing Joint Committee had recommended the Council to agree with the following conclusion of the conference so far as related to gas-mains:

> That the conference are of opinion that the subject of the best means of ensuring that gas-mains shall be inspected, and defects made good, whenever the street in which the mains are laid is opened in close proximity to the mains, should be considered by the bodies represented at the conference.
>
> Further, the conference recommend that, in the course of this consideration, special attention should be given to the following suggestions which have been adopted by the conference—viz.:
>
> (1) That, in the interests of the public and of the undertakers, there should be as complete co-operation as possible between the highway authorities and the undertakers (including all bodies or persons having power to break-up or open highways) and between undertakers themselves. With this object, procedure on the following lines is suggested for consideration:
>
> (*a*) The highway authority should, as far as practicable, before breaking-up or opening any highway for renewal or reconstruction, give reasonable notice to all undertakers affected.
>
> (*b*) The undertakers should forthwith, upon receipt of such notice, notify the highway authority of the position of their works in the portion of the highway to be broken-up or opened, and whether or not they propose to execute any work in relation thereto.
>
> (*c*) The highway authority should summarize the replies and send a copy of the summary to each of the undertakers.
>
> (*d*) Any undertakers who propose to break-up or open any highway should, in addition to notifying the highway authority, also notify the other undertakers concerned.
>
> (*e*) The undertakers should, when highways are broken-up or opened, take reasonable steps and be given reasonable facilities to ascertain, as far as possible, the condition of their respective works, with a view to executing such renewals and repairs as may appear to be necessary or expedient.
>
> (*f*) In cases of emergency, where it is not practicable to give previous notice, notice should be given as soon as practicable after the beginning of the work or the necessity for the same shall have arisen.
>
> (*g*) Periodical conferences should be convened between the highway authority and the undertakers to discuss difficulties and arrange procedure.

Generally, the Works Committee stated, they were in accord with the suggestions adopted by the conference. The procedure outlined in (*a*) was in force in Westminster at the present time. On (*b*), notice was always given by the undertakers prior to opening-up, with plan, in case of renewals or extensions of mains. With regard to (*c*), they did not see that the advantages to be gained were commensurate with the amount of labour which would be involved in summarizing and circulating the replies received from the undertakers. They agreed with suggestions (*d*), (*e*), and (*f*), and favoured periodical conferences (*g*) between the highway authority and the undertakers as necessity arose.

They recommended the Council to agree with the conclusions of the conference so far as set out, except as regarded clause (*c*).

The Council agreed.

The London County Council and the Recommendations.

The General Purposes Committee of the London County Council report that they have consulted the Highways and Public Control Committees with regard to the suggestions of the conference, and are of opinion that the proposals should be generally supported. The recommendations which concern the procedure to be adopted in dealing with proposals necessitating the opening-up of streets seek to give effect to what has, in fact, been the practice of the Council for many years; and their general adoption would be to the advantage of the highway authorities concerned. An important suggestion is contained in the recommendation that gas undertakers should be given additional powers as regards the inspection of piping and appliances which are placed in a consumer's house, and should also be empowered to refuse to give, or to continue to give, a supply of gas under certain circumstances. The Public Control Committee are strongly of opinion that a careful supervision in these respects would do much to obviate danger from leakage, and should, moreover, secure that consumers used gas with maximum efficiency. Effect might be given to the suggestion, if approved by the Board of Trade, by the insertion in future gas enactments of a model clause dealing with the subject.

CITY CORPORATION AND CHARGES FOR ELECTRICITY.

Dissatisfaction with prevailing charges for electricity in the City of London was expressed at last week's meeting of the Court of Common Council; and it was resolved that the matter should be inquired into.

Mr. Deputy SANDLE moved: "That it be referred to the Streets Committee to consider and report as to the charges in the City for electricity for public and private lighting, and for heating and power purposes, as compared with prices obtaining in other large towns and boroughs, and as to the steps (if any) which could be taken to obtain a reduction of the charges in the City." For some years, he said, the privilege of supplying the City with electricity was enjoyed by one Company; and when a second Company appealed to the Court for permission to lay mains within the one square-mile, one of the strongest arguments advanced was that the resulting competition would greatly benefit the consumers. At that time, the ordinary rate charged per unit was about 4½d.; while some large consumers paid only 2½d. and 3d. To-day, owing to an understanding between the Companies, competition did not exist, and the charge was 8d. per unit—being 33⅓ p.ct. more than in Hackney and some other Metropolitan boroughs. The difference constituted a heavy additional tax on the citizens. The rate was also from 30 to 60 p.ct. higher than was paid in some of the large provincial towns. The dividends paid by the two Companies in 1913 and 1922 were:

City of London Electric Lighting Company,	1913.	10 p.ct.
,, ,, ,, ,,	1922.	15 ,,
Charing Cross, West End, and City Company,	1913.	6 ,,
,, ,, ,, ,,	1922.	10 ,,

Where special privileges were granted to undertakings, giving them the monopoly of supply of such services as electricity, gas, and water, it was but fair that, after a reasonable dividend had been earned, any increased prosperity should be shared with the consumer; and in no case should the rate charged be higher than that levied in adjacent neighbourhoods where similar conditions obtained. He hoped that, as a result of the inquiry by the Streets Committee, the charges for electricity to City traders and residents would be greatly reduced.

Mr. Deputy RICHARD DAVIES, C.B.E., J.P., remarked that he voted some years ago for a second Electricity Company to have permission to operate in the City; and he did so on the ground that the charges of the original Company were excessive. For some years the incoming of the new Company had the effect of moderating these charges; but they made a wicked alliance. The Company having secured their powers on the ground which they advanced—that competition in the supply of electricity was for the benefit of the citizens—it was an unholy alliance to make a bargain with the other Company in order to defeat the very reason for which they obtained their powers. The present price of electricity in the City was unjustified. There were many advances during the war which might or might not have been justified; but one thing was clear—that if similar bodies outside the City had seen their way to make very considerable reductions in the charge for electricity for light and power, then it must be possible for the City of London and Charing Cross Companies, working in conjunction, to do the same thing, if they were only willing to do it. In the present circumstances, they were paying enormously increased dividends over those paid before the war. These were urgent and good reasons why some inquiry should be made.

The motion was unanimously adopted.

Cardiff Capital Issue Success.—The issue at par of £125,000 consolidated ordinary stock of the Cardiff Gas Light and Coke Company, which was advertised in a recent issue of the "JOURNAL," was quickly, and largely, over-subscribed.

Good Results at Devizes.—The Devizes Gas Committee, at a recent meeting, considered the figures as to the working for the year ended March 31 last, and decided to give a special reduction of 50 p.ct. on the March quarter accounts. They have reduced the price of gas for the ensuing quarter by 3d. per 1000 c.ft. in addition to the 50 p.ct. special reduction for the last quarter. This is a total reduction of 2s. per 1000 c.ft. during the last year. The Water Committee have also decided to make a special reduction on the March quarter accounts for water of a similar amount—viz., 50 p.ct. The Engineer and Manager (Mr. W. J. Rendell Baker) was highly complimented on the expeditious manner in which the accounts had been prepared, and upon the excellent results of the year's working.

TESTING GAS-METERS IN BIRMINGHAM.

Annual Report of the Official Inspector of Gas-Meters.

In his report to the Birmingham City Justices' Gas-Meter Testing Committee for the year ended March 31 last, Mr. Frederick Colburn, the Inspector, stated that the number of meters tested amounted to 115,052; this being an increase of 34,210, or 42·3 p.ct., as compared with last year. The exceptionally heavy increase is the outcome of the additional testing apparatus laid down last year, and indicates a rapid development of the meter trade in the district.

The fees charged amounted to £6418, being £2000 above the previous year's figure. The expenditure for the year, including the sum of £612 expended on new plant, was £3387 13s. 7d., showing a net credit balance of £3034, which has been carried to the Borough Fund. There were rejected 5827 meters, or 5·06 p.ct., as against 6·39 p.ct. last year. Of 13,788 wet meters tested, 1121, or 8·1 p.ct., were rejected; and of 101,264 dry meters tested, 4706, or 4·6 p.ct., were incorrect.

Of the 28,812 new meters submitted, 9120 were of the new standard sizes. Repaired meters numbered 85,362; and the remainder, 878, were submitted for reverification and certification. Of the total tested, 69,462, or 60·3 p.ct., were prepayment or slot meters. The figures for the year constitute a new record for this office; the increase in output being 75·77 p.ct. above the figures for 1914. To keep pace with the manufacturers' requirements, and also the needs of the several local authorities from the surrounding districts who have recently taken up the repairing of their own meters, it was again necessary to add two 5½ and one 11 c.ft. test holders to the number of standards. The two 5½-ft. holders, with table complete with auxiliary instruments, came into use in September last. The one 11-c.ft. holder was put down, completing another pair, in January last, to accommodate which additional alterations to the premises had to be made. The whole of the standard test holders and auxiliary instruments have been maintained in good working order.

Attached to the report are statistics showing the causes of error in meters rejected, and the causes of rejection in meters submitted for certification. Of 4707 meters rejected, 1918 were more than 2 p.ct. fast, and 1152 were more than 3 p.ct. slow; while 276 were rejected on account of excessive absorption of pressure. In the case of meters submitted for certification, 45, out of a total of 631, passed gas without registering, 320 were more than 2 p.ct. fast, and 96 more than 3 p.ct, slow. In the monthly summary of meters examined, it is shown that the highest percentage rejection was in May, 1922, when, of 7801 tested, 550 were rejected—or 7·5 p.ct. In November, no less than 10,148 meters were tested; only 3·5 p.ct. being rejected. During March of this year, 10,913 meters were tested; 3·7 p.ct. being rejected.

INSTALLATION OF NEW WATER-GAS PLANT AT HEREFORD.

The completion of the new water-gas plant has rendered the Hereford Gas-Works more efficient. To mark the occasion, the Chairman of the Gas Committee (Alderman C. Witts) invited the Mayor (Councillor J. C. M. Vaughan), members of the Corporation, and officials to visit the works; and this took place on Tuesday of last week.

The party assembled at the Town Hall and proceeded to the works in charabancs. The plant was inspected and explained. The carburetted water-gas plant was erected by Messrs. Humphreys & Glasgow, and has a capacity of 580,000 c.ft. per day. It is the most modern plant of its kind, embodying the latest improvements, which include a waste-heat boiler for raising all the steam required for working the plant. The erection was commenced in September of last year, and completed by the end of March. The whole of the work, which included foundations, building alterations, and a considerable amount of mainlaying, has been carried out under the supervision of the Gas Engineer, Mr. Arthur Roberts.

With this addition of modern water-gas plant, it is now possible to produce 1,250,000 c.ft. of gas per day; whereas previously 700,000 c.ft. was the maximum. The high-pressure plant includes two powerful gas-compressors, installed at the works, which deliver gas, through three miles of steel mains, to Hampton Park, White Cross Road, and the Gas Department's showrooms in West Street. At these points, the gas is passed through a district governor in order to reduce the pressure to the correct standard for consumption. This plant will enable the consumers in the outlying districts to obtain an unlimited supply of gas, irrespective of the demand elsewhere.

In addition, a new 24-in. main has been laid in the works from the gasholders to the station governors in place of a 16-in. main.

The Chairman of the Committee, after the inspection, entertained the company to luncheon at the Town Hall.

Dublin Lighting.—The Finance Committee of the Dublin Corporation report that the estimate for public lighting in the current year amounts to £74,706, against £74,713 last year. The Corporation have referred to the Public Lighting Committee for consideration a letter from the Free State Minister of Industry and Commerce, in reply to the request for an inquiry into the price of gas in the city.

More Opposition to the Bridlington Purchase.—Following a recent protest by the Bridlington Apartment House Keepers' Association against the contemplated purchase by the Town Council of the undertaking of the Bridlington Gas Company—as a result of a report by Mr. Arthur Valon who has valued the concern—the local Ratepayers Association have held a meeting, and passed a similar resolution of objection. Certain town councillors who were present stated that there had not yet been any declared intention of the Council to purchase the works. A councillor doubted whether one member in ten would be found to favour the purchase, and another councillor doubted whether one ratepayer in thirty would favour it.

THE NORTH-EAST COAST COAL TRADE.

From Our Own Correspondent.

There have been two items of interest during the week which have been much discussed on 'Change—the wages ascertainments for May and June, and the announcement by the miners that they intend to make May 1 a holiday in celebration of "Labour Day."

The ascertainments, based on January and February results, will put probably a shilling a ton on the Durham cost of production, and perhaps 7d. or 8d. in the case of Northumberland. The Trade had hardly expected such big increases in this case, as it had been thought that there was not sufficient coal available for sale in January and February, at the higher prices, to make a great deal of difference. Quite a considerable rise in wages must be looked for in July and August, when March and April results, with their greater quantities of higher-priced coal, will come into account.

As to the May Day holiday, the most frequent comment heard on 'Change is that it shows to what extent the extremists, with their international ideas, hold sway. It cannot be said that any great enthusiasm is noticeable among the rank and file. Durham, though the pits will be open, does not expect to draw any coal; while the Northumberland owners, at the time of writing, still seem uncertain as to the exact attitude of the men. It is considered doubtful whether any coal at all will be forthcoming. In any case, the late announcement of their intention on the part of the men has been quite in the nature of a bombshell. It means that collieries will probably be 200,000 tons short of their reckoning for the month; and this quantity, on a 35s. market, is bound to have a detrimental effect on the miners' wages later on. This, together with the sacrificing of a day's work, makes the men's attitude appear distinctly strange when so much is being heard of their "starvation" wages.

Meanwhile, the unexpected loss of a whole day's coal, and the inevitable "poor day after," has made the situation very difficult for collieries, buyers, and shippers alike. There is quite a panic for bunkers and odd lots to complete cargoes this week; and if there were any coal available, no doubt some fancy prices would be heard of. Quite apart from the idle day, the market was holding very firm, notably for steams, when all the other steam-coal markets were said to be dropping shillings. The demand for end-June shipments of all kinds continues unabated, with coking still leading the way. But, again, there has not been much doing beyond June; sellers being still unwilling to come down to figures at which buyers care to commit themselves.

Two interesting sales have been heard of which illustrate the strength of the market ahead. Best quality gas has been sold for export for the twelve months beginning July at 28s. f.o.b., and another good quality gas has been done for the second half of this year, also for export, at 32s. 6d. Current market quotations may be put at about 35s. for Wear Specials and best-quality gas, and 32s. 6d. for seconds.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

Gas coals are well sold by Yorkshire and Lancashire collieries, though prices as a rule are 1s. per ton more. So far as the coal trade generally is concerned, collieries are fully booked for some time ahead, mainly for export. The position really resolves itself into a question as to how long the present situation in the Ruhr will continue. Yorkshire prices f.o.b. Hull last week ruled as follows: Best South Yorkshire hards, 34s. per ton; West Yorkshire Hartleys, 31s.; South Yorkshire washed doubles and singles, 32s. 6d.; dry doubles, 28s. to 29s.; rough slack, 23s.; ½ in. smalls, 15s. 6d. to 16s.; furnace coke, 47s. 6d.

In Lancashire, the prices remained at 33s. at the pits for best house coal, and 20s. for "burgy." Washed slacks were 16s. per ton, and common slack 14s. Furnace coke was firm at 28s. per ton at the Lancashire ovens, and gas coke was 25s. at the works. The shipping trade was causing some scarcity in the supplies of slacks.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

The market for gas coal is characterized by great firmness. Large consumers in this district are unmoved by current conditions, and are very careful not to show their hand in regard to the new contracts. Feelers are, of course, being thrown out both by producers and consumers. Direct overtures are a rare feature of the situation, however. Collieries are naturally emphasizing the strength of the fundamental conditions which govern supply and demand. An advance of 2s. 6d. in contract prices is the general assessment, though some collieries observe reticence, and a few acquiesce in more moderate increases. Gas undertakings are very much on the alert as to deliveries. While there are some arrears to be overtaken, they do not bulk so large as a month ago. Stocks appear to be good as a rule. The policy of managements is to have something in hand when the real tug-of-war comes in June. Transport is satisfactory.

As to the reported decline in the export demand, there are few indications of it from the angle of the inland trade. There is, of course, a changed attitude with regard to coke. Foreign buyers are not prepared to stereotype the prices which have ruled during the recent tension. Hardly any effect is perceptible on home quotations, however. The tone of the market is rather easier, and definite relief is hoped for by blast-furnace owners. Gas coke continues in unusually brisk demand for this season of the year.

Major Boyd-Carpenter, replying to a question in the House of Commons with regard to Government investments, stated that the present market price of 850,000 £1 ordinary shares and 850,000 £1 preference shares in the British Dyestuffs Corporation, Ltd., is £743,750.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *April* 30.

The market for tar products is quiet. Business in pitch for this season seems finished, and in the absence of demand, the price is nominal at about 185s. per ton; but much lower prices are said to have been accepted for shipment during next season. Creosote is steady at about 10d. to 10½d. per gallon. Road tar is in good demand, and large quantities are already being taken. Pure benzole is about 1s. 9d. per gallon, 95/160 solvent naphtha 2s. per gallon, and pure toluole from 2s. to 2s. 3d. per gallon. Other products are without change.

Tar Products in the Provinces.

April 30.

The average values for gas-works products during last week were: Gas-works coal tar, 109s. 6d. to 114s. 6d. Pitch, East Coast, 177s. 6d. to 180s. f.o.b. West Coast—Manchester, 172s. 6d. to 177s. 6d.; Liverpool, 173s. 6d. to 178s. 6d.; Clyde, 175s. to 180s. Benzole 90 p.ct., North, 1s. 6d. to 1s. 6½d.; crude 65 p.ct. at 120° C., 1s. to 1s. 0½d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 8½d. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 1s. 6d. to 1s. 8d. Creosote, in bulk, North, liquid, 8½d. to 8¾d.; salty, 7½d. to 8d. Scotland, 7d. to 7½d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct., 3s. 10d. to 4s. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Aldershot Company's Gas Extensions.—The Directors of the Aldershot Gas, Water, and District Lighting Company have authorized the immediate extension of the gas supply to the Seale, Elstead, Peper Harow, and Thursley districts.

Gas-Cookers for Smoke Abatement.—Writing to the "Rochdale Observer," a correspondent styling himself "Wait and See," says: "It has been proved by tests that Rochdale is one of the worst towns in the country for soot. Most of this is caused by the use of raw coal in our houses. If this is so, as it appears to be, I should like to ask what the gas authorities are going to do in the way of mitigating this nuisance and the filth it causes? Is there nothing they can do in the way of educating householders that there are such things as gas-ovens? Will not a gas cooker in every home help to solve the difficulty? If so, gas concerns should get a move on, and emphasize the value of such useful alternatives to the coal-fire, by lowering prices. If they will not do this, they ought, in my opinion, to put the shutters up."

Bronze Age Finds at Wandsworth.

Great interest attaches, says the "Wandsworth Borough News," to a recent find at the works of the Wandsworth Gas Company of several objects of the Bronze Age. It is a founder's hoard, discovered during excavations on a site 150 yards due south of the Thames, and formerly known as Church Walk and Warple Road, now both done away with. The soil had been considerably made-up; and the hoard, which was in yellow sand, was about 6 ft. from the present surface, but probably not more than about 2 ft. from the original ground level. The weight of the hoard is about 9¾ lbs. The objects, which were found together in a heap, are seventeen in number; and of these, eight are lumps of founder's bronze, weighing together 6½ lbs. From the dark red colour of the bronze, it would seem that the percentage of tin is small. The articles are somewhat similar to some described in the British Museum Guide to Antiquities of the Bronze Age as having also been found at Wandsworth. Mr. R. Garraway Rice, F.S.A., Deputy-Chairman of the Wandsworth, Wimbledon, and Epsom District Gas Company, has furnished a full description of the nine implements just discovered.

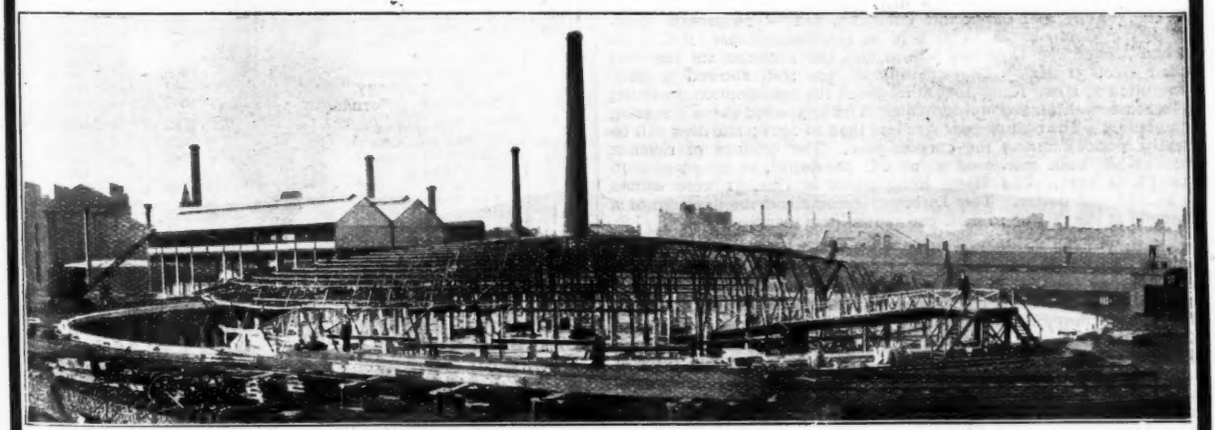
Forthcoming Auction Sale of Gas Stocks.—Readers desirous of adding to their holdings of gas stocks should note the announcement by Messrs. A. & W. Richards of an auction sale to take place at the Cannon Street Hotel, E.C., next Tuesday, May 8, at 2 o'clock, when there will be submitted lots of stock in the Gas Light and Coke, Wandsworth, South Suburban, Tottenham, Herne Bay, and Southend Gas Companies.

Southend Debenture Stock Over-Subscribed.—For the £40,000 of 4 p.ct. perpetual debenture stock which Messrs. A. & W. Richards offered to tender on behalf of the Southend Gas Company last week, the tenders sent in amounted to £76,390, ranging from £101 10s. down to the minimum of £97 10s. The lowest price to obtain an allotment was £98 10s., and the average price obtained for the issue was £99 4s. 6d. p.ct.

Gas-Works Saving at Llandudno.—To a meeting of the Llandudno Urban Council last week, Mr. Wm. Thomas (the Chairman of the Gas Committee) pointed out that they had just ended the first full year at the gas-works under the new conditions; and this was his tenth year of office as Chairman. When he took the position in 1913, the works were in a bad state, and were past serving a useful purpose. He would not go over the difficulties they had gone through; but the total gas made this year was 135,782,000 c.ft., an increase of 36,000,000 c.ft. over ten years ago. To make the gas required ten years ago, it took 8515 tons of coal; and this year they had only used 7000 tons. If they had been using the same plant to make this year's supply, 11,500 tons of coal would have been needed, at an extra cost of £4500. The average gas made per ton of coal during the year was 19,394 c.ft., as against 11,000 c.ft. with the old plant. These figures fully justified the expense they had gone to in reorganizing the gas-works.

The New "BEARSCOT" Roof Framing as applied to

A SEVEN-MILLION SPIRALLY-GUIDED GASHOLDER



This system ensures a substantial and rigid support, is rapidly erected, and is economical in cost.

The "Bearscot" specialities embody thirty years' practical experience in the construction of Spiral Gasholders, and their adoption ensures safety and smooth working.

R. & J. DEMPSTER, LTD.

MANCHESTER

LONDON OFFICE: 34, Victoria St., Westminster, S.W.1.

TELEPHONES: Central 54 & 2296. London Office: Victoria 7426.

South Metropolitan Gas Company's Assessment.

The Finance Committee of the Deptford Borough Council report that, at the Quinquennial Valuation of 1920, the South Metropolitan Gas Company entered an appeal against the figures inserted in the list in respect of their hereditaments; and upon the trading figures at that time, the Company were successful in obtaining a reduction in the assessment recommended by the Council's Valuers (Messrs. Dinwiddy & Sons) from £7366 rateable to £5584 rateable—the latter figure being £1532 lower than that in force during the preceding quinquennium. The assessment for the mains and services was placed at £5064 rateable. At the hearing of the appeal, it was recognized by the Company's Surveyor and the Assessment Committee that the financial position of the undertaking might be restored; and it was agreed that either the Rating Authority or the Company might require a provisional valuation list to be made including the Company's hereditaments. In view, therefore, of the operation of the Company's new Charges Act and the largely increased revenue received by the Company during the past year, the Committee have given instructions for the assessment of the mains and services, from which the revenue is derived, to be placed in a provisional valuation list, in order that the matter may be re-opened with a view to adjusting the assessment in accordance with the presumed enhanced financial position of the Company.

Electrical Scheme Abandoned.—The Lurgan Urban Council resolved to abandon the scheme for the electric lighting of the town, it being stated that the estimated cost, £20,000, would be a very serious burden on the town which would not be warranted, and that expense already incurred would entail a substantial increase in the rates.

Gas-Works Accident at Huddersfield.—While painting an iron bunker at the Longwood Gas-Works of the Huddersfield Corporation, on April 24, Ernest Fox, a labourer, fell from a ladder to the ground 30 ft. below, and was taken to the Infirmary with injuries to the head and back, and suffering from shock. Some time ago he had the sight of one eye injured by the bursting of a boiler gauge, and a fortnight ago injured a knee in another mishap.

Electric Project Objected to.—Farmers in the Toome district of co. Antrim have decided to oppose the Bann Electricity Bill now being promoted in the Northern Ireland Parliament, because they believe its operation would result in raising the waters of Lough Neagh, the proposed source of power, and so damaging the lands and involving loss and hardship in connection with economic holdings. Some thousands of people are concerned. The scheme is in the hands of the River Bann Syndicate, and its object is to provide power for industrial purposes in various towns in the Northern area, with lighting when required.

A Reduction Promised at Rhyl.—Mr. Llew Edwards (Chairman of the Gas Committee), in opening an exhibition of gas appliances at Rhyl last week, said he had hoped that he would be able to announce a reduction in the price of gas to the consumers. Personally, he was in favour of an immediate reduction, and advocated this during the consideration of the estimates for the current year. But they were still saddled with a small debt, as the result of the coal strike; and though they would wipe practically all that debt off during this financial year, the Council decided to maintain the present price until the incubus of the debt was removed. However, they could rest assured that as soon as circumstances permitted, a very substantial reduction in the price of gas would be effected.

Hong Kong and China Gas Company, Ltd.—The general meeting of the Company is to be held at Gresham House, E.C.2, tomorrow, when the Directors will submit the accounts for the year ended Dec. 31 last. The quantity of gas sold showed a small diminution at Hong Kong; but at Kowloon the consumption continues to increase, and the new holder which is being erected there is nearing completion. The cost of coal was less than in 1921; and this will be greatly reduced during the current year. The balance of revenue account has been converted at 2s. 6d. per dollar, as compared with 2s. 7½d. in 1921. The Hong Kong assets at Dec. 31 were valued at 2s. 2⅞d. per dollar. The Directors recommend the payment of a dividend at the rate of 10 p.ct. per annum (less income-tax).

Future of the Montgomery Gas-Works.—The future of the Montgomery Gas-Works was discussed at a meeting of the Town Council on Thursday last, when offers for taking over the concern were received from Mr. T. W. R. Sargent, of Bishops Castle, and Mr. A. D. Butler, of Erdington, Birmingham. Mr. Sargent offered to pay £50 for the first year, with a revision at the end of that period—the sum to include rates and taxes. The other offer was to instal in place of the gas plant an electric station, subject to the Council's agreeing to take it over again at a valuation at the expiry of a given period, or to guarantee a definite consumption of electricity. The feeling was expressed that the second offer might result in the Council's being involved in a serious financial undertaking; and it was eventually decided to ask a Committee, consisting of the Mayor and Town Clerk, to meet Mr. Sargent and arrange terms.

The Directors of the Oriental Gas Company, Ltd., have resolved to pay, on May 31, an interim dividend at the usual rate of 3⅛ p.ct., less income-tax, on account of the year ending on June 30 next.

A destructive fire, last Thursday, at the works of the Sheffield Steel Products, Ltd., Sheffield, seriously threatened a holder containing 80,000 c.ft. of gas. It was for some time a very doubtful question whether the great heat generated by the fire—which gutted a large canteen built during the war to accommodate 5000 munition workers, and a small printing works—would not destroy the holder. The paint and tar on it were practically stripped by the heat; but the brigade directed intense efforts on preventing the danger threatened, and succeeded, though the gas plant was only fifteen yards away, and the men had to work in a 6 ft. gangway which separated the canteen from the main works.

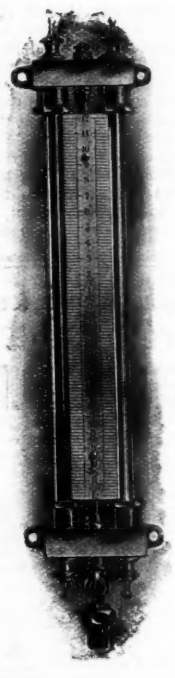
The Victory Prepayment Meter is now advertising itself, so we are bringing to your notice our

GAUGES

All Sizes

For all Purposes.

Enquiries Solicited.



SAWER & PURVES

MILES PLATTING, MANCHESTER. RADFORD ROAD NOTTINGHAM.

45 & 47, Westminster Bridge Road, LONDON, S.E.

Telephone Nos. { 3289 (City) Manchester. 2025 (Central) Nottingham. 2412 (Hop) London.

Wires { "Sawer Manchester." "Sawer Nottingham." "Metrique Lamb London."

STOCK MARKET REPORT.

THE Stock Exchange had a fairly good week in respect of activity and firmness; gilt-edged things giving a lead. Home Governments were good; Friday's figures for the big four being: Consols 59½ 60, War Loan 101¼-101½ *ex div.*, Funding 93 93⅜. Victory 94⅜-94⅝. Colonials and Indian were steady. Home Rails were a little uneven at times. The Foreign Market had some good points in French, Brazilian, Argentine, and Japanese. Rubber and Oil made some improvement.

Business in the Gas Market gave way to loyal enthusiasm on Thursday, but otherwise was fairly active, and the tone was very firm. Advances in quotations were as numerous as ever—perhaps even more so—and were distributed all over the list. In the London Companies, Gas Light ordinary rose 1½, the preference 2, and the debenture 1; South Metropolitan ordinary and 3 p.c. debenture 1 each. In the Suburban and Provincial group, Aldershot pref. rose 2, Alliance and Dublin 4, Croydon max. div. 1, Hornsey 12, Newcastle 1, Portsea "B" 5, ditto "C" 4, and Southampton 2. In the remoter world, European rose ¼, Hong Kong 3, Malta and Mediterranean ¼, Monte Video 5, and San Paulo debenture 1. Imperial Continental and Primitiva were not much dealt in.

The following transactions in gas during the week were recorded: On Monday, Brentford 5 p.c. preference 88, Bristol 91, European 8½, Gas Light ordinary 98½, 98⅛, 98⅝, 98¾, ditto 3½ p.c. maximum 67½, 67¾, ditto 4 p.c. preference 79½, 79⅝, Imperial Continental 167, 168, 168½, Malta and Mediterranean 80s., 82s. 6d., Oriental 100, Primitiva 10s., ditto 5 p.c. preference 38s., San Paulo 5⅛, South Metropolitan 99, 99¾, ditto 6½ p.c. debenture 106½, Rochester; Chatham, and Gillingham 80, 80½, Romford 4 p.c. debenture 75, 75½, Southend 4 p.c. debenture 75⅜, Wandsworth 5 p.c. preference 99. On Tuesday, Bristol 92, Commercial 4 p.c. 98½, ditto 3½ p.c. 97½, ditto 3 p.c. debenture 58½, 58¾, Croydon sliding-scale 102½, ditto maximum dividend 85, European 8⅜, 8½, Gas Light ordinary 98⅞, 99, 99½, ditto 4 p.c. preference 79½, 80½, ditto 3 p.c. debenture 62½, 62¾, ditto 10 p.c. bonds 192, Hastings and St. Leonards 5 p.c. 95½, Imperial Continental 167, 168, Liverpool 5 p.c. 89 13/16, Primitiva 5 p.c. preference 39s. 6d., South Metropolitan 99, 99¾, ditto 6½ p.c. debenture 106⅞, Suburban 101⅜, Wandsworth 5 p.c. preference 99, 99½. On Wednesday, Alliance and Dublin 65, 65½, Bombay 5⅛, Brentford 5 p.c. preference 90, Bristol 92½, Commercial 3½ p.c. 97½, Gas Light ordinary 99, 99¾, 99½, 99¾, 100, ditto 3½ p.c. maximum 67, 67⅛, ditto 4 p.c. preference 80, 81⅜, Imperial Continental 166, 169, Monte Video 60½, 61, 62, Primitiva 10s. 1½d., South Metropolitan 99, 100, 100⅜, 100¾, Aldershot 5 p.c. "A" 91. On Thursday, Bombay 5⅛, European 8 11/16, 8⅞, Gas Light ordinary 99⅞, 99⅞, 100, 100½, 100¼, ditto 3 p.c. debenture 63½, 64, Imperial Continental 167, ditto 3½ p.c. debenture 76½, 77, Newcastle 83½, Portsea "B" 105½, 107½, South Metropolitan 100, Barnet "B" 155½, 156, ditto "D" 110, 110½, Brighton and Hove 6 p.c. preference "D" 100. On Friday, British "A" ordinary 13¼, 13⅜, 13 7/16, European 8 15/16, 9, 9 1/16, Gas Light ordinary 99⅛, 100, 100⅛, 100⅛, 100¼, ditto 3½ p.c. maximum 68, ditto 4 p.c. preference 81, 81½, Imperial Continental 167½, 168, 168¾, 169, Monte Video 61, 61½, South Metropolitan 99½, 100, 100⅜, ditto preference 98, 98½, Swansea 6½ p.c. debenture 104½, Barnet "A" 156, 156½, ditto 4 p.c. debenture 75, 75½, British (Norwich) 3 p.c. debenture 60, Reading 5 p.c. maximum 75, Uxbridge, Wycombe, and District 4 p.c. debenture 79, 79½.

In the Money Market, even lower rates were at one period obtainable; business being done at ½ p.c. Unusual ease continued almost to the close, when a slight recovery was apparent. Discount was comparatively firm. Silver varied as Eastern buyers and sellers alternated, closing about 32 11/16d. The Bank of England rate was 3 p.c., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
137,978	Stk.	Feb. 22	—	5%	Aldershot 5 p.c. max. C.	..	71—79	...
190,492	,,	,,	4	4%	Do. 4 p.c. Pref.	..	70—75	
1,551,868	,,	Apl. 5	2½	5%	Alliance & Dublin Ord.	59—64	62—67	65—65½
374,000	,,	Jan. 11	4	4%	Do. 4 p.c. Deb.	76—79	60—65	
280,000	5	Oct. 19	7½	4/-	Bombay, Ltd.	5⅞—6⅛	4⅞—5⅛	5⅛
100,000	5	Feb. 22	16	8/-	Bournemouth Gas and Water { 5 p.c.	..	11—12	...
383,110	10	,,	7	7/-	{ B 7 p.c.	15—15½	11½—12½	...
115,000	10	,,	6	6/-	{ Pref. 6 p.c.	13½—14	10—11	...
162,065	—	Dec. 29	—	4%	{ 4 p.c. Deb.	..	71—76	...
992,045	Stk.	Feb. 22	14	6⅞/-	Brentford A Consolid.	261—266	100—105	..
734,920	,,	,,	11	6⅛/3	Do. B New	204—209	97—102	...
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	85—99	88—90
221,400	,,	Dec. 14	4	4%	Do. 4 p.c. Deb.	91—93	78—83	...
214,775	,,	Mar. 8	11½	8½%	Brighton & Hove Orig.	208—213	173—178	...
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	130—135	...
1,272,500	Stk.	Feb. 22	5	5%	Bristol 5 p.c. max.	..	90—93	91—92½
570,000	20	Mar. 22	12½	10/-	British A Ord.	44—45	12½—13½	13⅛—13 7/16
10,000	10	Dec. 29	—	7/-	Do. 7 p.c. Pref.	..	12—13	...
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
220,135	,,	Dec. 29	4	4%	Buenos Aires 4 p.c. Deb.	85—87	55—58	...
100,000	10	Nov. 2	—	—	Cape Town & Dis., Ltd.	1½—2½	6½—7½	...
100,000	10	Oct. 19	—	—	Do. 4½ p.c. Pref.	4—6	6—7	...
100,000	Stk.	Dec. 29	4½	—	Do. 4½ p.c. Deb. Stk.	70—75	72—77	...
237,863	,,	,,	—	7½%	Cardiff 7½ p.c. Deb.	..	107—112	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	..
1,513,280	,,	Mar. 8	5/9/4	60/-	Commercial 4 p.c. Stk.	106—108	97—100	98½
560,000	,,	,,	5½	60/-	Do. 3½ p.c. do.	103—105	97—100	97½—97½
475,000	,,	Dec. 14	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—60	58½—58½
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	27—32	...
200,000	,,	Dec. 14	7	4%	Do. 7 p.c. Pref.	115—118	57—62	...
660,000		Mar. 8	—	6%	Croydon sliding scale.	..	100—103	102½
284,975		,,	—	5%	Do. max. div.	..	83—86	85
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
209,000	,,	Apl. 5	—	5%	East Hull 5 p.c. max.	..	..	...
1,002,180	10	Jan. 25	10	5/0	European, Ltd.	17½—18	8½—9½	8½—9 7/16
16,146,120	Stk.	Feb. 8	4/17/4	52/-	Gas Light and Coke { 4 p.c. Ord.	98—102	99—101	98½—100½
2,600,000	,,	,,	3½	35/-	{ 3½ p.c. max.	76—79	66—68	67—68
4,062,235	,,	,,	4	4%	{ 4 p.c. Con. Pref.	96—99	80—82	79½—8 ½
4,761,930	,,	Dec. 14	3	3%	{ 3 p.c. Con. Deb.	72½—74½	62—65	62½—64
130,000	,,	Dec. 11	10	10%	{ 10 p.c. Bonds	..	..	192
	—	—	—	—	{ 7½ p.c. Ilford Deb	..	..	..
82,500	,,	Mar. 8	5	65/7½	Hastings & St. L. 5 p.c.	..	92—97	95½
258,740	,,	,,	3½	50/7½	Do. 3½ p.c.	87—89	75—78	...
70,000	10	May 18	11	10%	Hongkong & China, Ltd.	16½—16½	9—10	...
86,600	Stk.	Mar. 8	9	9½%	Hornsey 7 p.c.	..	147—152	..
1,976,000	,,	Nov. 16	9	£5	Imperial Continental	150—160	165—170	167—169
404,800	,,	Feb. 8	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	75—78	76½—77
235,242	,,	Mar. 8	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	93—98	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord.	..	..	89 13/16
600,000	,,	Mar. 22	—	7%	,, 7 p.c. Pref.	..	103—105	...
165,736	,,	Feb. 22	7/5/6	80/-	Maidstone 5 p.c.	..	107—112	...
63,480	,,	Dec. 29	—	3%	Do. 3 p.c. Deb	..	53—58	...
75,000	5	June 29	6	6%	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4⅛—4½	3⅞—4⅛	4—4⅛
100,000	100	Apl. 5	4½	4½%	Monte Video, Ltd.	99—101	97—100	...
541,920	Stk.	Nov. 30	4	4%	Newcastle & Gatsh'd Con.	11½—12	60—65	60½—62
1,875,892	,	Feb. 22	4½	5½%	Do. 4 p.c. Pref. Stk.	98½—99½	83—84	83½
250,166	,,	,,	—	4%	Do. 3½ p.c. Deb.	..	76—78	...
529,705	,,	Dec. 29	3½	3½%	North Middlesex 10 p.c.	82—83	68—69	...
15,000	10	Aug. 26	—	7/6	,, ,, 7 p.c.	..	..	...
55,940	10	Mar. 8	7/14/0	7/8⅞	Oriental, Ltd.	14—15	10⅛—11½	...
300,000	Stk.	Nov. 30	8	8%	Plym'th & Stonh'se 5 p.c.	117—122	97—102	100
188,120	Stk.	Dec. 29	—	72/6	Portsea Island, B	..	94—99	...
60,000	50	Mar. 8	13	65/-	Do. C	128—131	103—108	105½—107½
100,000	50	,,	12	60/-	Primitiva Ord.	118—121	100—105	...
290,069	5	—	8	—	Do. 5 p.c. Pref.	5½—6	⅛—¼	10/—10/1½
499,960	5	—	5	—	Do. 4 p.c. Deb.	4⅛—5	1⅛—2⅛	38/—39/6
521,600	100	Nov. 30	4	4%	Do. ,, ,, 1911	91—93	70—73	...
600,000	Stk.	Jan. 25	4	4%	River Plate 4 p.c. Deb.	..	55—58	...
346,198	,,	Dec. 29	4	4%	San Paulo { 6 p.c. Pref.	85—87	55—58	...
150,000	10	Mar. 22	6	6/-	{ 5 p.c. Deb.	10⅛—11	5⅛—6	5⅞
125,000	50	July 3	5	5%	Sheffield A	47—49	37—39	...
135,000	Stk.	Mar. 22	10	5%	Do. B	223—224	96—98	...
209,984	,,	,,	10	5%	Do. C	222—224	96—98	...
525,300	,,	,,	10	5%	Shrewsbury 5 p.c.	220—222	96—98	...
133,201	Stk.	Sept. 15	4	4%	South African	..	..	...
90,000	10	Nov. 2	9	7½%	South Met. Ord.	10⅛—11⅛	7—9	...
6,609,895	Stk.	Feb. 22	5/4/0	60/-	Do. Red. Pref.	111—113	99—102	99—100⅛
250,000	,,	Jan. 11	—	5%	Do. 3 p.c. Deb.	..	96—98	98—98⅛
1,895,445	,,	,,	3	3%	Do. 6½ p.c. Deb.	72½—74½	62—64	..
734,000	,,	Mar. 8	—	6½%	South Shields Con. Stk.	..	105—107	106½—105⅞
91,500	,,	Feb. 22	8½	8½%	S'th Suburb'n Ord. 5 p.c.	157—159	115—117	...
1,087,795	,,	,,	6	6%	Do. 5 p.c. Deb. Stk.	114—116	99—102	101½
368,837	,,	Dec. 29	5	5%	Southampton Ord.	116—118	93—98	...
647,740	,,	Nov. 2	5	7%	Do. 4 p.c. Deb. Stk.	99—102	87—90	...
121,275	,,	Dec. 29	4	4%	Swansea 7 p.c. Pref. Stk.	..	68—73	...
250,000	,,	Mar. 8	—	70/-	Do. 6½ p.c. Deb. Stk.	..	102½—104½	...
200,000	,,	Dec. 29	—	6½%	Tottenham District { A 5 p.c.	..	103—105	104½
120,000	,,	Feb. 22	—	7½%	{ B 3½ p.c.	135—138	123—128	...
782,275	,,	,,	6	6%	{ 4 p.c. Deb.	115—117	102—107	...
181,255	,,	Dec. 14	4	4%	Tynemouth 5 p.c. max.	87—89	75—80	...
258,251	Stk.	Mar. 22	5	5%	Wandsworth, Wimbledon, and Epsom—	108½—109	90—92	...
					Wandsworth A 5 p.c.	151—156	130—135	...
30,000	,,	Feb. 22	8½	87/6	Do. B 3½ p.c.	129—134	115—120	...
255,636	,,	,,	6½	72/6	Do. C.	..	100—105	...
1,8,,075	,,	,,	—	61/3	New Ordinary	..	100—105	...
140,865	,,	,,	—	61/3	Wimbledon 5 p.c.	117—122	109—114	...
352,000	,,	,,	6½	68/9	Epsom 5 p.c.	121—126	115—120	...
98,000	,,	,,	6½	73/9	3 p.c Deb. Stk.	66—69	56—59	...
88,416	,,	Dec. 29	3	3%				

SALE OF STOCKS AND SHARES.

By Order of Trustees.

GAS AND WATER STOCKS AND SHARES

in the

GAS LIGHT AND COKE COMPANY,
WANDSWORTH, WIMBLEDON, AND EPSOM DISTRICT GAS COMPANY,
SOUTH SUBURBAN GAS COMPANY,
TOTTENHAM DISTRICT LIGHT, HEAT, AND POWER COMPANY,
HERNE BAY GAS COMPANY, LTD.,
GT. YARMOUTH WATER-WORKS COMPANY,
SOUTHEND GAS COMPANY,

to be sold by Auction by

MESSRS. A. & W. RICHARDS

at the CANNON STREET HOTEL, LONDON, E.C., on Tuesday, May 8, at two o'clock, in Lots.

Particulars of the AUCTIONEERS, 37, WALBROOK, E.C. 4.

GASHOLDER AND TANK CONSTRUCTION AT THE SUTTON GAS-WORKS.

1,000,000 cubic feet capacity.

By F. SOUTHWELL CRIPPS.

Price 10/6 net.

WALTER KING, LTD., "GAS JOURNAL," OFFICES, No. 11, Bolt Court, FLEET STREET, E.C. 4.

INDEX TO "JOURNAL" ADVERTISERS.

	PAGE
Ackroyd & Best, Ltd.	261
Aerograph Co., Ltd.	—
Alder & Mackay, Ltd.	—
Aldridge & Ranken, Ltd.	—
Allan, Thomas, & Sons, Ltd.	307
Amalgamated Dinas Silica Works, Ltd.	—
Anglo-American Oil Company, Ltd.	—
Anglo-Swedish Electric Welding Co., Ltd.	—
Arden Hill & Co.	—
Ashmore, Benson, Pease, & Co., Ltd.	311
Automatic Light Controlling Co., Ltd.	—
Bagshawe, and Co., Ltd.	—
Bale & Church, Ltd.	305
Balfour, Henry, & Co., Ltd.	—
Barrowfield Ironworks, Ltd.	249
Bates, J., & Sons	306
Belliss & Morcom, Ltd.	252
Benn Bros., Ltd.	—
Berendsen, Sophus (London), Ltd.	251
Berk, F. W., & Co., Ltd.	Wrapper I.
Blair, Campbell, & M'Lean, Ltd.	313
Blakeley (Firth) Sons, & Co., Ltd.	307
Bland Light Syndicate, Ltd.	—
Braddock, J. & J.	305
British Aluminium Co., Ltd.	—
British Creosote Company, Ltd.	—
British Furnaces, Ltd.	—
British Gas Purifying Materials Company, Ltd.	305
British Mannesmann Tube Co., Ltd.	—
British Thomson-Houston Co., Ltd.	—
British Uralite and Cellactite Works	247
Brotherton & Co., Ltd.	305
Brown, John, & Co., Ltd.	261
Brownhills Chemical Works Co.	—
Bugden, T., & Co.	—
Burt, Boulton, & Haywood, Ltd.	—
Cannon Iron Foundries, Ltd.	—
"Captive Fire"	—
Carless, Capel, & Leonard	—
Carron Company	—
Chance Bros. & Co., Ltd.	Centre VII.
Chapman (Spencer) & Messel, Ltd.	305
Chemical Engineering and Wilton's Patent Furnace Company, Ltd.	—
Clark's Syphon Stove Co., Ltd.	—
Clapham Bros., Ltd.	—
Clayton, Son, & Co., Ltd.	315
Clayton, Thomas (Oldbury), Ltd.	—
Cloake, A. G.	Centre VI.
Cockey, E., & Sons, Ltd.	257
Coin Change Company, Ltd.	Centre VII.
Columbus Machinery, Ltd.	—
Cossey, E. J., & Co.	—
Cowan, W. & B.	Wrapper III.
Crossley Bros.	Wrapper IV.
Curtis's & Harvey	—
Cutler (Samuel) & Sons, Ltd.	Centre VIII.
Davies, Wm. Everard, & Co., Ltd.	260
Davis Gas Stove Co., Ltd.	—
Davis, Sandwell and Co.	—
Davison & Partner, Ltd.	310
Dempster, R. & J., Ltd.	301
Dempster, R., and Sons, Ltd.	Centre II., 307, 313
Dixon, Joseph, Crucible Company	—
Donkin Company, Ltd. (The Bryan)	Wrapper II.
Dorman, W. H., & Co., Ltd.	—
Drakes Limited	315
Drew-Bear, Perks & Co., Ltd.	—
Duxbury, Thomas, & Co.	307
Economical Gas Apparatus Construction Company, Ltd.	Centre VI.
Edgar, Wm.	—
Engineering Supplies, Ltd.	—
Evans, Joseph, & Son (Wolverhampton), Ltd.	310
Ewart & Son, Ltd.	—
F. C. Construction Co., Ltd.	308
Falk, Stadelmann, & Co., Ltd.	259
Flavel, Sidney, & Co., Ltd.	—
Fletcher, Russell, & Co., Ltd.	—
Foamite Firefoam, Ltd.	—
Fraser and Chalmers Engineering Works	—
Gas Lighting Improvement Co., Ltd.	307
Gas Meter Company, Ltd.	Wrapper IV., 257
Gas Purification and Chemical Company, Ltd.	Wrapper I., 305
Gibbons Bros., Ltd.	316
Glenboig Union Fire Clay Company, Ltd.	308
Glover (George) and Co., Ltd.	Wrapper I.
Glover, Thos., & Co., Ltd.	264
Goodacre, William, & Sons, Ltd.	—
Goodall, Clayton, & Co., Ltd.	251
Grainger, J. E.	—
Grant, David, & Co.	255
Grantham Boiler and Crank Company, Ltd.	306
Green and Boulding, Ltd.	307
Griffin, John J., & Son, Ltd.	—
Griffiths Bros. & Co. (London), Ltd.	Wrapper I.
Hall, John, & Co., Stourbridge, Ltd.	307
Hamilton, Arch. H., & Co.	—
Hardman and Holden, Ltd.	248
Harris and Pearson	314
Hawthorn Leslie & Co.	—
Head, Wrightson, & Co., Ltd.	Wrapper I., 312
Hislop, R. & G.	254
Hodges, R. J., & Co.	—
Holborn Lamp and Sign Works	307
Holmes, F. G., & Co., Ltd.	305
Holmes, W. C., & Co., Ltd.	248
Hooper and Weyman, Ltd.	307
Horseley Bridge and Engineering Company, Ltd.	Wrapper II.
Horstmann Gear Company, Ltd.	—
Hulett, D., & Co., Ltd.	—
Humphreys and Glasgow, Ltd.	262
Hutchinson Bros., Ltd.	—
Hydronyl Syndicate, Ltd.	—
Jenkins, W. J., & Co., Ltd.	—
Jobson and Beckwith, Ltd.	255
Johnson, W., Junr.	—
Keighley Gas and Oil Engine Company, Ltd.	—
Keith, James, and Blackman Company, Ltd.	316
Kent, Geo., Ltd.	261
Kenyon, Alexander, & Co., Ltd.	307
Kieselguhr Supplies Co.	—
King's Patent Agency	305
Kirkham, Hulett, and Chandler, Ltd.	—
Laidlaw, R., & Son (Edin.), Ltd.	314
Laidlaw, R., & Son, Ltd.	—
Le Grand, Sutcliff, and Gell	—
Lead Wool Company, Ltd.	—
Lord, J. E. C. (Manchester), Ltd.	305
Low Temperature Construction, Ltd.	Centre III.
Main, R. & A., Ltd.	253
McKelvie, James, & Co.	Wrapper I.
Meldrums Limited	—
Messenger & Sons	—
Mewburn, Ellis, & Co.	305
Midland Builders Supply.	—
Midland Railway Carriage and Wagon Co., Ltd.	Wrapper IV.
Mitchell, H.	—
Moore, Walter, & Sons	Wrapper I.
Morden, S. H., & Co., Ltd.	—
Neill & Son, Ltd.	Wrapper I.
New Conveyor Co., Ltd.	310
New Inverted Incandescent Gas Lamp Co., Ltd.	—
Newton, Chambers, & Co., Ltd.	314
Orme, George, & Co.	—
Oughtibridge Silica Firebrick Company, Ltd.	249
Page, Chas., & Co., Ltd.	—
Parkinson and W. & B. Cowan, Ltd.	254
Parkinson Stove Company, Ltd.	259
Parkinson, W., & Co.	264
Peckett & Sons, Ltd.	308
Peebles & Co., Ltd.	—
Penney and Porter, Ltd.	305
Penningtons Engineering Tutors	305
Perch, William, Ltd.	307
Pifco, Ltd.	—
Piggott, Thos., & Co., Ltd.	254
Pocock, Herbert	—
Podmore, A. E., & Co.	—
Potterton, Thos.	—
Procter, E. W.	248
Pulsometer Engineering Company, Ltd.	Wrapper IV.
Radiation, Ltd.	Centre IV., V.
Ramie Company, Ltd.	—
Reavell & Co., Ltd.	247
Richmond Gas Stove & Meter Co., Ltd.	—
Ride and Bell, Ltd.	—
Riley, John, & Sons, Ltd.	—
Robson, Geo., & Co.	307
Rotary Meter Company, Ltd.	308
Sawer & Purves	302
Serck Tubes, Ltd.	247
Shields & Ramsay	—
Sigma Instrument Company	—
Simon-Carves, Ltd.	245
Simplex Concrete Piles, Ltd.	—
Smith, J. & W. B., Ltd.	263
Smith Meters, Ltd.	—
South Metropolitan Gas Company	313
Spencer-Bonecourt, Ltd.	—
Spencer Chapman, & Messel, Ltd.	305
Spencer, Walter, & Sons.	305
Stanton Ironworks Co., Ltd.	—
Stein, J. G., & Co., Ltd.	Wrapper I.
Stephenson, Andrew	305
Stewarts & Lloyds, Ltd.	Wrapper I.
Stothert & Pitt, Ltd.	—
Stringer Bros.	—
Sugg, Wm., & Co., Ltd.	—
Sutherland Meter Company, Ltd.	252
Taylor, Joseph, & Co. (Saturators), Ltd.	305
Telephos, Ltd.	—
Thermal Syndicate, Ltd.	260
Thompson, John (Wolverhampton) Ltd.	307
Tilley High Pressure Gas Syndicate, Ltd.	—
Torbay Paint Company	Wrapper I.
Trier Bros., Ltd.	—
Trotter, Haines, and Corbett, Ltd.	307
Tully Gas Plants, Ltd.	258, 305
Turbine Furnace Co., Ltd.	—
Underfeed Stoker Co., Ltd.	—
Vee-Reg Valves—Engineering Specialists, Ltd.	307
Vertical Gas Retort Synd., Ltd.	246
Vickers, Ltd.	251
Vislok, Ltd.	256
Volker Lighting Corporation	—
Walker, C. & W., Ltd.	Centre VI.
Walker, Crosweller, & Co.	307
Waller, Geo., & Son, Ltd.	246
Waugh, Walter, & Co.	254
Welsbach Light Company, Ltd.	256
West's Gas Improvement Co., Ltd.	250
Westwood and Wrights	308
Whessoe Foundry and Engineering Company, Ltd.	309
Wholesale Fittings Company, Ltd.	—
Wilkinson, G.	—
Williamson, Cliff, Ltd.	—
Willey & Co., Ltd.	—
Wilson, Carter, and Pearson	—
Wilson (George) Gas Meters, Ltd.	305
Wilsons & Mathiesons, Ltd.	—
Wood, Hugh, & Co.	—
Woodall-Duckham Company	Centre I.
W.R. Patents, Ltd.	255
Wright, Alex., and Co., Ltd.	Centre VIII.
Wright, John, & Co.	—

Appointments Vacant and Wanted	305
Company Notices	—
Contracts Open	306
Educational	—
Plant Wanted and for Sale	305
Stocks and Shares	303